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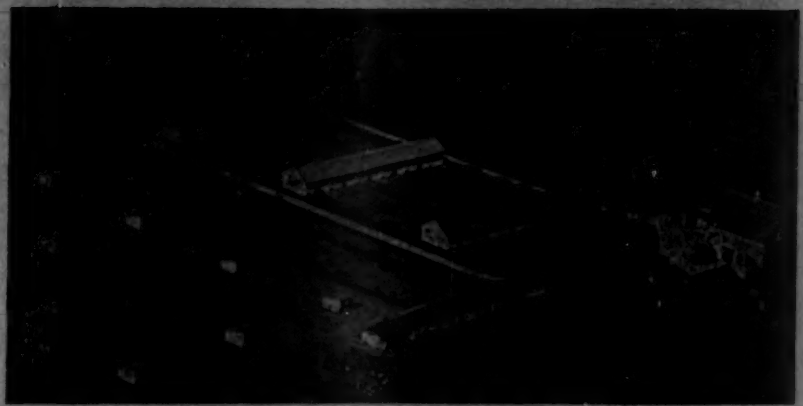

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WORLD'S POULTRY SCIENCE JOURNAL

Volume 8 July-Sept. Number 3

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"THE POULTRY MARKETING GOAL"

O. F. JOHNDREW, JR.

Poultry Branch, Production and Marketing Administration, U.S. Dept. of Agriculture, Washington, D. C.

"Consumer satisfaction" is an ultimate objective of marketing. It should be the marketing goal toward which everyone in the poultry industry aims. In order to satisfy the consumer, it is necessary to know what she wants. To this end, let us see what the average consumer in the United States wants in poultry meat.

CONSUMER PREFERENCE

The results of several consumer surveys in many cities and in several States of the United States show that generally speaking, the consumer wants fresh, ready-to-cook[1] (cut-up or whole) poultry of good quality at what she considers a reasonable price. She thinks it is a good idea to have poultry graded and labeled A, B, and C, inspected for wholesomeness and marked with information such as the processor's name, weight, price per pound, and total price. In chickens, the consumer prefers fryers and roasters to other classes, and she usually buys chicken on Friday and Saturday to be consumed on Sunday. More consumers eat turkey at Thanksgiving and Christmas, and they prefer 14, 12, and 16 pound turkeys, in that order, to those of other weights. In some areas of the country, the consumer prefers chicken to pork, lamb, or fish, when cost is not a factor. However, she usually prefers beef to chicken.

MISLEADING TERMS

The housewife, and we speak of the housewife as the consumer because she does the purchasing in about 85 percent of the families, prefers fresh poultry to frozen. Many housewives believe that the term "fresh" means that the bird has just been killed. They say they wouldn't buy frozen, packaged poultry because they don't know how long the birds have been dead. Some homemakers say they like the idea of "fresh" or they want to know it's "fresh." Another factor that enters the picture is cost. More high income families buy frozen poultry than do low income families. Low income families, being more conscious of price, would undoubtedly purchase fresh poultry more often.

[1] Ready-to-cook poultry is dressed poultry from which the protruding pinfeathers, vestigial feathers, (hair or down), head, shanks, crop, oil gland, windpipe, esophagus, entrails, reproductive organs, and lungs have been removed and with or without the giblets. It can be whole or cut-up.

The author believes that the poultry industry should avoid the use of the term "fresh." It is very often misleading. Some time in the not too distant future, the consumer is going to understand that a bird labeled "fresh" was not necessarily killed yesterday, or that it has not necessarily come directly from the farm to the retailer, or that it is not necessarily "fresher" than frozen poultry. She is also going to learn something about the advantages of frozen poultry; that it may be more wholesome and in better condition than "fresh" poultry; that it keeps better far longer (provided it is held under the proper conditions); and that it may be "fresher" than "fresh" poultry. The latter statement is particularly true when poultry is frozen immediately after being eviscerated and packaged and then handled properly from there to the consumer. The housewife is going to learn that frozen ready-to-cook poultry bearing the U.S. inspection or grade marks has been processed and quick-frozen under sanitary conditions. She is going to learn to associate certain brands with poultry processed and quick-frozen under sanitary conditions.

ADVANTAGES OF READY-TO-COOK POULTRY

The homemaker generally prefers ready-to-cook poultry to dressed[2] poultry because it is more convenient and because she doesn't like to clean dressed (New York dressed) birds. In these surveys, some consumers bought ready-to-cook birds at a higher price than they would have had to pay for dressed birds because they realized that the net cost to them for the edible portions from either style of processing was about the same. The ready-to-cook method also allows the retailer to have the eviscerating done more economically at the processing plant than it can be done by a clerk in the store at the time when the purchase is made and customers are waiting.

Many people insist that the consumer doesn't know poultry quality. If these people mean that the average housewife does not know the factors of quality that make a bird an "A" quality bird, the assumption is quite correct. However, if they mean that the housewife doesn't recognize birds of high quality as compared to those of lower quality, their judgment can be questioned. She may not be able to separate borderline birds into A's or B's, but she wants a good quality bird and she would like to have it labeled "A," "B," and "C,' or with other terminology that she can understand. She may not be

[2] Poultry which has been slaughtered for human food with head, feet, and viscera intact and from which the blood and feathers have been removed.

able to place the birds she purchases in each separate quality classification, but she thinks of "A" as being the top, or the best quality she can buy. From there, any housewife of average intelligence knows that she shouldn't have to pay as much for a "B" as for an "A" quality bird. The consumer is going to learn that many times she is paying top price for a "B" quality bird. Even though the "B" quality bird may be of good quality, she shouldn't pay "A" quality prices for it.

UNIFORM STANDARDS AND GRADES

This brings up the matter of uniform standards and grades. Although space does not permit a discussion of this topic in detail, it should be stated here that as soon as the consumer knows "A" means that the bird so labeled meets certain uniform minimum standards and that she can go from New York to California and buy an "A" quality bird which meets the same minimum standard requirements, the sooner more graded poultry will be sold. Make no mistake about it, the consumer knows good quality birds when she sees them. When she can depend on the letters "A," "B," and "C," or on other simple terminology, she will buy more poultry that she can't see (poultry enclosed completely in a package). This means more frozen poultry sold. It also means that there should be more poultry bearing the U.S. Grade mark and that the consumer should have a more thorough understanding of what that mark means. The U.S. Grade mark will give her assurance that minimum uniform standards of quality are used.

SOME OTHER SURVEY RESULTS

One of the surveys studied show that consumers thought that Federal inspection for wholesomeness and the placing of pertinent information on the label were good ideas because it would help to assure the buyer of a better product and of more nearly getting their money's worth.

Some reasons given by consumers for purchasing other meats in preference to poultry are: They were tired of poultry; the price of poultry was too high; they didn't like poultry; the birds didn't look good; they could not get the kind of bird preferred; and that they like variety. Practically all the complaints of consumers were directed to processing, finish, size, lack of quality, and faulty merchandising of poultry.

WILL CONSUMERS DESIRE CHANGE?

What the consumer now wants may be satisfactory for the time being. What about the future? We would hazard the

following prophesies: (1) More uniformly graded and officially inspected, ready-to-cook poultry will be sold; (2) more poultry will be sold in frozen form; (3) and a greater variety in kind and class of poultry will be made available for sale at the same time, particularly in larger retail and chain stores. These things won't happen suddenly. They are gradually and slowly evolving now.

The above facts are based upon the assumption that the consumer eventually gets what she wants. Consumers' wants are going to change when she understands all the facts concerning the product she buys—facts concerning the advantages of freezing, uniform terminology, standards and grades, inspection, and many others, about which she does not now have a complete understanding. Some day she is going to know all of these things. If this is hard to believe, take a look at the tremendous and growing amount of consumer education being conducted by Federal and State agencies, trade and industry associations, and consumer groups.

SUMMARY

The information in this article is presented with the reminder that it is now and will be necessary for us to find more outlets and to increase the demand for poultry in order to take care of the increased production which has taken place in the United States in recent years. By giving the consumer what she wants and should receive, more poultry should be sold. This will not only help to maintain production, but will even cause an increase in production, other factors being favorable. The words "should receive" are used to cover the use of terms such as "fresh" and "inspected for wholesomeness." Although the term "fresh" is now misleading to the housewife, it is not necessary to continue to mislead her: Although the meaning of "inspected for wholesomeness" is not usually known to the consumer, it does not mean that she should be expected to buy anything but a clean, wholesome product processed under sanitary canditions. Therefore, until she knows what these and other smiilar terms mean, the consumer should not only be given what she wants, but what she should have and will expect when the terms used are standardized and are better understood.

The producer being the originator of the product will have to know what the consumer wants in order to turn over to the first buyer the best possible product. The first buyer in turn will have to know what the marketing goal is in order to maintain properly the product sold him by the pro-

ducer and to turn it over to the second buyer in as near the original form as possible, and so on through the marketing chain until the product reaches the consumer. In order to relay what the consumer wants, and should have, back to the producer, closer working relationships between retailers, distributors, and producers will have to be established. A better job of public relations will have to be done. For only to the extent that producers and distributors know what is desired will the poultry marketing program be successful.

To keep up to date on what the consumer wants, it is suggested that periodic consumer surveys be made in the markets on which poultry is sold. Based on the analysis of sound consumer surveys, give the consumer what she wants and should have.

As an aid and as a basis for use in developing future consumer surveys, a few references are given:

"A Consumer Study in Poultry." (Processed Report.) Agricultural Experiment Station, University of Delaware, Newark, Delaware.

"A Survey of Consumer Preferences Regarding Dressed Poultry in the City of Des Moines." Agricultural Trade Relations, Inc., Public Relations—Economic Research, Empire Building, Des Moines, Iowa, January, 1941.

"Consumer Preference in Turkeys." Survey conducted by H. H. Alp, Professor Poultry Extension, University of Illinois, Urbana, Illinois, in cooperation with the Illinois Turkey Growers Association in 1945. (Typewritten Report.)

"Will Turkey Parts Sell?" U.S. Egg and Poultry Magazine, Vol 53, No. 11, November, 1947.

"Have You Tried A Turkey Quarter?" By L. E. Dawson and G. S. Wood of Purdue University. U.S. Egg and Poultry Magazine, Vol. 54, No. 5, May, 1948.

"Consumer Response to the Marketing of Cut-Up Turkey." C. M. Fischer and D. B. De Loach. Oregon Agricultural Experiment Station Bulletin No. 457, 33 pp., August, 1948.

"Consumer Preferences Are Key to Marketing Trends." B. F. Tobin, Swift and Company. U.S. Egg and Poultry Magazine, Vol. 54, No. 9, September, 1948, pp. 12-13, 26-28.

"Cost, Quality Determine How Often Most Consumers Buy Chicken." H. E. Larzelere and J. B. Leaver, Michigan Agricultural Experiment Station, U.S. Egg and Poultry Magazine, Vol. 55, No. 8, August, 1949, pp. 10-11; 28.

"Retailing Prepackaged Meat" (includes information on consumer acceptance of prepackaged meats and poultry). A. T. Edinger, B. H. Mewis, H. D. Mumford, James E. Bryan and Donald R. Stokes. U.S. Department of Agriculture, PMA, Marketing Research Branch, Washington 25, D.C., December, 1949.

BRANCH ASSOCIATION

The South African Branch of the World's Poultry Science Association has just been approved.

Mr. M. S. Letty of the South African Poultry Association, P.O. Box 1795, Johanesburg, Transvaal, is secretary.

IN-PLANT CHLORINATION IN POULTRY DRESSING PLANTS

M. A. HOWE, JR. and H. E. GORESLINE
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The cleanliness of a food product has a direct relationship to the sanitary practices employed in the plant in which it was produced. Hence, a poultry plant must be operated under strict commercial sanitary conditions to produce a clean product. As you know, the inspector's job is to remove the unwholesome birds from a processing line, but he can not judge visually to what degree the surface of a bird is contaminated by microorganisms. If a bird is judged wholesome, it probably does not have detrimental pathogenic organisms in the meat, skin or bones. But the exposed surface area will have an invisible contamination of microorganisms, and it is this contamination which is responsible for poor sanitary quality, product spoilage and possible illness of the consumers. Eliminating or lowering this contamination is governed almost entirely by the operational methods employed in the plant producing the product.

The three most important aids used in a food plant to facilitate effective cleansing are large volumes of water, chemicals, and various types of scrubbing action. In-plant chlorination falls in the second group, but by itself is very ineffective without the application of the other two.

In-plant chlorination is accomplished by the injection of gaseous chlorine into the main water supply of a processing plant by an automatic proportioner. The injection of the chlorine is done on the premises so that it can be regulated to the requirements of the operations of the plant.

The amount of chlorine used in the plant water is usually much greater than that which is found in municipal drinking water. The chlorine is present in quantities great enough not only to kill the bacteria in the water, but also to kill any bacteria which the water will contact on the birds or equipment. Drinking water will usually contain less than one part per million of chlorine, while it was found by experimentation that ten or twenty parts per million are required in a poultry plant to perform an effective killing action. With the application of 20 parts per million of chlorine to all of the water used on the killing and eviscerating line, it was found that the contamination on the ready to pack birds was lowered 97 percent below that present when no chlorine was used.

In lowering the count that much in tests of the process, two things were accomplished. First, there was less probability of pathogenic organisms being present. Second, the number of food spoilage organisms was markedly reduced, so that the chance of product spoilage was diminished. The latter factor is exceedingly important where the birds are to be sold unfrozen, for previous research has indicated that shelf life can be extended two or three days by the use of chlorinated water during processing.

Experiments have proved that the application of chlorine to the processing water is extremely ineffective when improper cleaning, improper handling, sloppy or inefficient operations, and poor sanitary procedures are practiced.

In order to demonstrate this, filthy birds, with adhering fecal material and dirt, were passed through a spray washer. So much fatty material and filth was present that the spray water was unable to remove all of it. After the washing operations these birds had a high bacterial count, for the action of the chlorine was destroyed by the presence of large amounts of fecal or organic matter, and, therefore, was unable to reduce the gross contamination of the microorganisms.

For chlorine in the processing water to be most effective, all operations in the plant and on the processing line, especially those that aid in cleansing the product, should be highly efficient and effective. Only when this is so may chlorine exert its full action in eliminating the high percentage of the remaining bacterial population. Therefore, chlorine performs a successful mopping-up operation and exerts its full effect in killing bacteria only when good sanitary practices are followed. Chlorine cannot substitute for good sanitary practice and good plant operation.

In our bacteriological study of the processing line we found that a mechanical washer which employed water sprays and whirling rubber fingers performed a much more thorough operation as a final wash for both the kill and the eviscerating lines than a plain spray type washer. In fact, it was very efficient, for no matter how filthy a birdwas when it entered the machine, it had no visible filth on it when it emerged. Furthermore, the spray washer alone removed only 60 percent of the surface bacteria whereas the mechanical washer removed 88 percent of the surface bacteria present. It can be seen that the chlorine would have fewer bacteria to eliminate if the mechanical washer was employed; therefore, it could do a much more thorough job of eliminating the remaining contamination.

Where do poultry become contaminated in a poultry dressing plant, and how will in-plant chlorination help to combat this contamination? A quick inspection of a battery of live birds will reveal that the average birds are well covered with dust and particles of fecal matter. Hence, all of this type of contamination must be removed in addition to the feathers before the bird is really ready for the eviscerating room.

Under normal conditions, at best, a portion of this filth remains on the birds after they leave the killing line. That is the reason that mechanical washing is usually the first operation that the birds pass through on an evisceration line. An attempt is made in this operation to cleanse the exterior of the birds, so that bacteria on the surface will not be transferred to the visceral cavity or to the exposed muscle tissue when the bird is being eviscerated. Therefore, if chlorinated water is used in the mechanical washer, the external flora will be reduced to an even lower level. We found that the use of 20 parts per million of chlorine at this point reduced the number of surface bacteria by 93 percent, which was indeed an increase in the efficiency of this operation.

Once the external bacterial flora were reduced, recontamination of the surface took place when the operations of cutting the neck skin, crop milking, crop removal, cutting around the vent, removal of viscera, inspection, lung and kidney removal, and so forth, were performed. All these were operations in which workers handled the birds. The greatest amount of recontamination took place during the cropping operation, vent cutting, and as the entrails were removed. All this added contamination had to be removed in order to deliver a bird of acceptable sanitary quality. The operator who flushes out the visceral cavity with water can perform his function more efficiently with the extra help of chlorine. Surprisingly enough, the finishing operation before the final washer increased the bacterial count on the surface of the birds.

The final outside washing operation has the important function of removing all the bacteria which were transferred from the inside of the bird to the outside. As mentioned before, we found the spray washer was very inefficient in doing this and by replacing the spray washer with a mechanical washer the operation was improved.

Even more phenomenal were the results obtained when 20 parts per million of chlorine were used in the processing water employed in the mechanical washer. Such a condition

assured an even cleaner and more sanitary product. Further experiments showed that immersion of these chlorine-treated birds in a chemical dip and scrubbing by hand did not lower the count an appreciable amount. This indicated that the combination of a mechanical washer and 20 parts per million of chlorine, at this point on the eviscerating line, cleaned birds more thoroughly than any commercially feasible operation now in use.

Even though a product may be cleansed thoroughly during a certain operation on a processing line, the benefit of the operation may be nullified by the next operation if the equipment employed is not clean. Hence, the cleanliness of equipment and, also, the hands of personnel are very important factors.

The use of chlorine in the flush water of troughs, wash water for pans, and other equipment is of great significance. Any surfaces where birds are placed or handled, such as on table tops, should have continuous streams of water flushing across them. When non-chlorinated water was used these surfaces were found to harbor large numbers of bacteria. After a few hours of operation these surfaces were usually covered with a thin layer of slime-forming bacteria. When chlorinated water was employed the slime was completely eliminated.

Where surfaces are continually flushed with water bacteriological tests showed that the bacterial population could be decreased at least 94 percent with the use of 20 parts per million of chlorine. This would help to limit the possibility of further contamination of birds coming in contact with equipment and working surfaces. If the working surfaces are clean, the hands of the personnel are also likely to be clean, especially if the chlorinated flush water is used for rinsing their hands.

Where slime is present there is usually odor. The odors in an eviscerating room can be markedly reduced or eliminated if chlorinated water is allowed to flush all machinery and working surfaces where growth is likely to take place. The absence of odor not only indicates clean plant operations, but also provides more pleasant working conditions for plant personnel. Eviscerating rooms do not have to be characterized by decomposition odors.

The use of chlorinated water for the clean-up operation has been shown to reduce clean-up time by about one-third that necessary when chlorinated water was not in use. This

is due to reduced amount of slime growth and adhering matter on floors, equipment, walls, and so forth.

The cost of the chlorine used in dressing and eviscerating 15,000 birds a day with the necessary plant clean-up was about $2.00, which is an insignificant amount per bird.

In-plant chlorination helps processors keep their plants cleaner, helps them produce poultry that is of better sanitary quality and, therefore, has better keeping qualities. Such poultry has a greater market value and promotes consumer satisfaction.

It should be remembered, however, that chlorine cannot be used as a substitute for good sanitary practices. If efficient operating procedure and good sanitary practices are followed, chlorine will assist in reducing bacterial populations, but if inefficient operating procedures and poor sanitary practices are followed, the use of chlorine will be ineffective.

LINDANE FOR LICE

The results of recently conducted experiments by Mr. Steve Moore III, University of Massachusetts, Amherst, Mass., indicate that lindane can be easily and effectively employed in controlling the body louse, the shaft louse, and the fluff louse. Lindane may be applied as a dust or as a vapor.

Although the dust was a wettable powder diluted with pyrophylite (2 percent lindane) used at the rate of 3 pounds per 1,000 square feet of chicken-house floor space, the author suggested that straight dust would probably be as effective. The dust mixture was applied to the litter and nests and beneath the roosts in laying houses that were equipped with roosts. One application eliminated active lice after one day and the flocks were apparently free of lice for as long as three months.

Lindane vapor was applied by using an electrically heated device which could be adjusted to disperse minute quantities of the insecticide for stated periods of time. It was found that 3 grams of lindane per 20,000 cubic feet of laying-house volume per day for 13 days would eliminate lice in 10 days and keep the laying house free of lice for about 5 months whereas if 8 grams of lindane were used instead of 3, lice were eliminated after 2 days and the laying house remained free of lice for over 5 months.—Morley A. Jull.

RESEARCH IN POULTRY PHYSIOLOGY

C. S. SHAFFNER
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Most of the economically important characters of poultry are influenced by many genes and therefore show a wide degree of variation. Certain genetic complexes then must in turn influence the activity of the endocrine glands and the physiological processes influenced by their hormones. Basic research is thus necessary to determine the mechanisms by which traits of economic importance are altered.

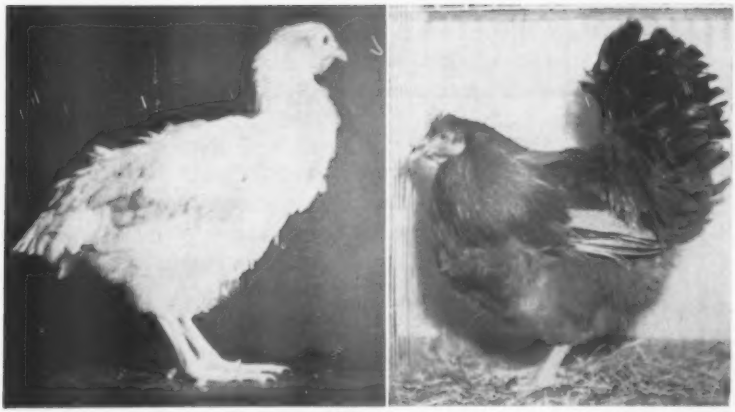
NEW STRAINS OF POULTRY BEING DEVELOPED ON BASIS OF PHYSIOLOGICAL DIFFERENCES

For many years, poultry research men have recognized that there are tremendous differences between strains of birds in respect to their rate of growth, egg production, and other characters of economic importance, all under genetic control. Already it has been shown that there are strain differences in the response of the thyroid to induced thyroid deficiency. Distinct strains of birds are now being developed on the basis of this difference. At the same time, these strains are being studied for differences in economic characters. The project offers promise of determining some of the mechanisms which influence rate of growth, egg production, feathering, disease resistance, etc. In addition, the mode of inheritance of these characters is being investigated.

HORMONAL CONTROL OF ECONOMIC TRAITS IN POULTRY

The endocrine system of the body produces many different hormones which exert a marked influence on many body processes. Rather recently, synthetic compounds have been developed that have hormone-like activity or depress the normal hormone activity. The thyroid gland is known to exert a marked influence on general metabolism, hence upon feed utilization and fattening. A combination of one-tenth of one percent thiouracil, a thyroid depressant, plus one gram per hundred-weight thyroprotein to the broiler ration increased the market quality of the bird and increased their feed efficiency. However, at the present price of thiouracil, the benefits would not appear to justify the cost of the treatment.

Research is also being conducted to study the hormonal and genetical factors concerned in the chicken's response to adverse environmental conditions such as cold, extreme mus-



Left, an albino mutant chicken that appeared in a strain of New Hampshires. Right, a creeper-type chicken resulting from the removal of the anterior pituitary gland.

cular exercise, and simulated high altitudes. These conditions elicit an adaptation response that is accompanied by a loss in weight, regression of the lymphatic tissues, and an enlargement of the adrenal gland. Since the adrenal appears to be the most directly concerned endocrine gland, the new drug, cortisone, may find a place in poultry production when it becomes commercially available at reduced prices.

SARAWAK'S POULTRY INDUSTRY

Sarawak borders on the China sea and consists of the northwest coast of the island of Borneo, which lies south and somewhat west of the Philippines. From information sent me by Mr. A. M. Rahamdolah, Kampong, Sarawak, British Borneo, with whom I have had correspondence for the past two years, it is apparent that the poultry industry is rather meagerly developed. Duck egg production is relatively more important than chicken egg production, the climate being quite suitable for duck raising. The Chinese are the principal duck raisers. Chickens are kept mostly in the villages and recently shipments of Rhode Island Red chicks have been imported by air from Australia with a view toward the development of better laying strains.—Morley A. Jull.

TENDER GREEN PASTURE SAVES MASH

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During the spring new grasses and clovers are tender and very palatable to poultry. It is a beautiful sight to see a flock of pullets or poults feeding on closely cropped tender green pasture. There is no doubt that these birds are eating green feed in place of some mash, and the pullets will eventually produce better as layers or breeders than their confinement reared sisters. Comparative feeding experiments have proved that using high quality pasture for chickens to be kept as layers or breeders, or for turkeys, usually pays in mash saved and improved quality. The big question is how to manage the range in order to obtain tender green pasture from early spring until late fall. Help with this problem has come from agronomy and soil research. Rapid progress with improved grasses and clovers, better fertilizers and even irrigation, is solving the pasture problem.

GROWING TURKEYS FOR MARKET OR BREEDERS

Turkeys are able to use larger amounts of green feed than most poultry. An average good permanent grass and clover pasture that has been fertilized and receives enough moisture will support about 200 turkeys per acre. The usual practice is to supply free range and move the roosts, feeders, and waterers to a clean area once a week. Comparisons between range-reared vs. confinement-reared turkeys reveal that range rearing may save from 5 to 25 percent on mash and grain. The variation depends on palatability of the pasture and the length of time it was tender enough to be eaten in quantity.

GROWING CHICKENS FOR LAYERS OR BREEDERS

The amount of mash and grain that can be saved by growing pullets and breeding cockerels on range varies from one or two percent up to ten percent. Feeding comparisons show that sometimes pullets grown in confinement respond as well in the laying house as range reared pullets, but numerous tests demonstrate that some flocks of range reared birds lay more eggs and live better. The biggest saving, favoring range over confinement rearing, appears to be in the usually improved quality of the pullets, rather than the amount of feed saved.

BROILERS

Green feed or pasture is not recommended for broilers. Present day feed formulas will produce good broilers without added green feed or range. When broilers eat enough green feed to give an appreciable saving of mash, the broiler houses become damp and the broilers grow slower than when no green feed or pasture is provided. This is explained on the basis that the bulky green feed replaces concentrated grain or mash that the broiler would eat and provides less nutrients for growth. The practice of allowing broilers to run outside during the summer for comfort and to prevent smothering is recommended, however.

THE TAINTING OF EGGS BY PARADICHLORBENZENE

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Paradichlorbenzene is one of a number of agents used to deter moths. Contamination of poultry foods rarely occurs, but when it does the taint is quickly apparent in the eggs and persists for a remarkable length of time.

A domestic poultry keeper (one who can keep up to 25 birds) had the dust cover of his car treated with paradichlorbenzene, and on return it was placed beside, but not in contact with, his balancer poultry meal (a compounded poultry food prepared for domestic poultry keepers for use in connection with household and garden scrap). In two or three days the eggs were tainted. The taint was recognized and the contents of the meal bag were destroyed. It was then expected that the eggs would soon lose the taint, but the eggs remained quite inedible for a month, and at the end of five weeks, as a check on the owner's palate which might have become hypersensitive, some eggs were submitted to this laboratory. The taint, whether the eggs were boiled or fried, was definitely noticed, though by then no longer strong enough to make the eggs completely inedible.

SUCCESSFUL LARGE SCALE SHIPMENTS OF BABY CHICKS BY AIR NOW PROVED POSSIBLE

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Until April and May, 1952, it was not known for sure that long distance shipments of baby chicks by the plane load between different countries could be carried out successfully. But three complete plane loads of chicks, totaling about 215,888 chicks including the normal extras, shipped on April 28th, May 5th and May 12th from Bradley Field near Hartford, Connecticut, U.S.A. to Linz, Austria, with a total loss enroute of less than ½ of 1%, proved without question that such shipments are feasible, *provided* there is careful planning of every detail of the organization, handling enroute, and (from the standpoint of the consignee) adequate organization of the distribution at the destination.

This large order for chicks, believed to be the world's largest order to date for shipment overseas by air, was placed with the Agricultural Company of Pan America, Guilford, Connecticut, U.S.A. by the Austrian Government. As a result of many years of close connection with the breeding industry of the United States, and several years of successful experience in handling shipments of baby chicks to other countries, with the complete cooperation of the breeding and hatching industry, The Agricultural Company of Pan America undertook the tremendous job of organizing the shipments.

As far as humanly possible, the difficult problems connected with these shipments were anticipated in advance and plans were made to overcome the problems. But until the planes actually arrived in Austria it was not definitely certain that the job could be done, though the Agricultural Company of Pan America believed it could be done, otherwise it would not have undertaken such big shipments.

Preparations for these shipments extended over a period of several months. The vast amount of detail would amaze anyone not familiar with such complicated problems. The selection of breeders and hatcheries to supply over 200,000 chicks, free from disease, to go together in such large quantities, the arrangements with the airlines for cargo planes of the largest size, the drawing up of contracts with the airlines and breeders, the planning of the arrival of the chicks at the airport so they would arrive from all twenty or more cooperating breeders and hatcheries on a definite arrival schedule as the plane was being loaded, were some of the problems.

In addition, the planning and building of the framework within the plane to get the greatest possible circulation of air between the piles of chick boxes, the planning for additional air movement in the plane, the selection of a very experienced attendant to accompany the shipment to keep a close watch over temperature and ventilation during every moment of the twenty four to thirty hours in which the chicks were in the plane, the arrangements for health certificates for all the shipments and also the pedigree records for the wing-banded pedigreed chicks that were a part of the shipment, the financing of the shipment so that the breeders and hatcherymen could be paid immediately for the chicks supplied by each one—all these problems and many more had to be worked out in advance.

The safe arrival at the destination of over 99½% of the order, of fine, healthy chicks of the best U.S. breeding, even went beyond the good results that could reasonably be hoped for under favorable conditions. Needless to say, both the shippers and the consignees were highly pleased.

Bradley Field, Hartford, Connecticut, was selected as the loading center because this airport is more centrally located for the finest breeding area of the United States than any other airport. There is plenty of room, and loading conditions are ideal. Within a hundred miles or more in each direction an adequate supply of all the five popular breeds of high pro-

Putting the finishing touches on the loading. Already over 70,000 chicks have been packed, by hoisting about 50 boxes at each lift, in this KLM-C54 cargo plane. Soon after loading the last few boxes the plane departed for Austria.

duction quality—Rhode Island Reds, Barred Rocks, White Leghorns, White Rocks and New Hampshires—could be secured in sufficient quantity. The shipments to Austria consisted of most of these breeds. In addition to the 200,000 chicks purchased by the Austrian Government for the 4H Club young people of Austria, nearly 10,000 Individually Pedigreed and Wing banded chicks were purchased by the expert breeders of Austria. These shipments could go a long way to re-building the poultry industry of Austria.

K.L.M. Royal Dutch Airlines leased to the Agricultural Company of Pan America the three chartered planes for the shipments—three large C 54 type cargo planes—and were very cooperative in helping to solve the transportation problems. The planes arrived at Bradley Field on schedule, departed on schedule, and arrived at the destination in Austria on schedule. Skilled members of the K.L.M. staff tied down the cargo in the plane during the loading so that it would not shift during the flight.

Experience has shown that the chief problems to be solved consist of organizing the assembly of chicks that are healthy and safe to go together, the control of temperature and ventilation, both while the plane is grounded and while in the air, the continuous observation of the chicks in flight by an attendant experienced in handling large quantities of chicks, and careful organization of the distribution by the consignee at the destination so that the chicks can be fed and watered without delay upon arrival. The build up of animal heat from the bodies of so many chicks together in one place must be guarded against every minute by big exhaust fans and air conditioning equipment at landing fields when the plane is on the ground. No problems connected with the shipment of baby chicks by air in plane load lots are insurmountable, provided adequate planning is done. Shipments up to thirty six to forty hours in the plane are practical, provided the chicks are taken directly from the incubators to the plane, and provided the distribution at the destination is accomplished promptly.

The novelty of such big overseas shipments of chicks by air caught the public imagination and resulted in a vast amount of publicity in Europe and in the United States. The account of the flight appeared in large numbers of newspapers and magazines, on television and on radio. Many photographs and moving pictures were taken during the loading operation. In addition to the radio audience large groups of people, including many officials, witnessed the loading and unloading of the planes.

The successful handling of these three plane loads of chicks opens the door to more large shipments of this type. It is believed that many countries will eventually want to replace their native stock or to increase their poultry industry by chicks from the best breeding sources. Financing such large shipments may be a problem for some countries, but it is believed that where such shipments are possible the increased income from eggs and poultry meat, will soon repay the original investment.

HATCHING EGGS TO PAKISTAN

United States hatching eggs have been going to far-away Pakistan in order to raise the standard of living of that nation.

The United Nations Food and Agriculture Organization thinks that expansion of Pakistan's poultry production will be the best way of increasing the nation's standard of living.

Says the United Nations group, "an international effort to help Pakistan improve its poultry industry, thereby increasing protein consumption, has been successfully initiated at Karachi, and chickens from as far away as the United States and Australia have been contributing eggs to the project."

In the new nation of 80 million people, only four or five eggs are available for each person per year. Per capita consumption in the United States is 96 times as great.

MODEL POULTRY FARM

FAO, in conjunction with the Pakistan Ministry of Food and Agriculture, has set up a model poultry farm near Karachi. This will be the nucleus of an educational program to help Pakistan farmers to increase their poultry yields and profits.

Already, people are being trained at the model farm and are traveling around the nation bringing the story of the advantages to be derived from poultry raising to the citizens.

Main problems in the new Pakistan poultry venture, are lack of reliable breeding stock, eradication of poultry diseases and the creation of additional model poultry farms by the Government so that Pakistan's prospective poultry raisers can be taught by example.

INFECTIOUS BRONCHITIS CONTROL

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Infectious bronchitis control is carried out in the Northeastern States by individual state control programs. There are no commercial vaccines available at the present time.

FOR BROODER CHICKS

Broilermen are interested in protecting their birds from infectious bronchitis since it causes a slow growth and when occuring at marketing time, an unmarketable bird. The vaccine used for replacement stock has not been practical for the broilerman because of its severity in reaction. A bronchitis strain has been modified so that it could be mixed with intranasal Newcastle disease virus and administered to chicks one to ten days old without causing excessive mortality. This combination vaccine has been applied intranasally or on the eye to over three million broilers in 162 field experiments conducted by the Animal Disease Department of the Storrs, (Conn.) Experiment Station. The vaccine produces mild respiratory symptoms about one week following vaccination, which lasts for about ten days. In the latter of these experiments the total mortality up to five weeks of age has averaged about three per cent. This includes all birds dying during the first five weeks. Tests at five weeks of age have shown about 75% of the birds containing measurable blood antibodies. Seventeen of the 162 lots of vaccinated broilers have had respiratory troubles of economic importance. Twenty-four lots have had mild respiratory symptoms that did not seem to interfere with growth or feed consumption. In only one of these 41 outbreaks were we able to isolate bronchitis. Observations made on these experimental flocks have indicated that respiratory diseases other than infectious bronchitis and Newcastle disease are causing difficulties in broiler raising.

FOR GROWING STOCK

Immunization has been obtained by infecting a small number of birds at a desirable age and allowing the disease to spread to the remaining flock. This program originated in Massachusetts and has been adopted by nearly all the New England States. It was intended to offer protection for the egg producer. The vaccine is administered in various manners;

namely, by swabbing the trachea, spraying into the air sacs, and intranasal instillation.

Intranasal instillation appears to be the most practical from the standpoint of the poultryman and state laboratory. The immunity induced is usually good and normally protects the birds throughout the laying season. A few cases have been observed where infectious bronchitis has infected birds that were vaccinated and the reinfection did cause a drop in egg production. The original thinking that a lifetime immunity was induced by vaccination has been altered by this fact. It is now felt that the birds are protected for the most part, but that reinfection can occur.

Chicks hatched from hens that have had bronchitis usually have some parental immunity for varying periods up to four weeks. This immunity, that is carried over from the parents, provides some, but not complete protection for these first few weeks.

The best time to immunize replacement stock by the methods mentioned is when the birds are six to twelve weeks old. If various age groups are involved, it is best to have the youngest at least five weeks old and the oldest not more than 14 weeks old. Many poultrymen feel that chickens which have bronchitis remain carriers. Experimentally it has been shown that these birds remain carriers for only about five weeks following recovery.

It is sometimes expected that birds immunized for bronchitis are protected for all respiratory diseases. Immunization for bronchitis protects only for bronchitis and the birds are still susceptible to all other respiratory diseases.

No vaccination program is absolute, therefore all vaccinations should be considered an insurance and not a guarantee.

RUYKYU ISLANDS POULTRY ITEM

At the present time, five representatives of the Ruykyu Islands are visiting the United States for the purpose of learning how their native land can improve its industry and agriculture. Messrs. Yuhei Izumi, Tsumichiyo Asato, Kitatsu Kawamae, and Minoru Shinda visited the University of Maryland poultry department to learn of practical ways and means of improving poultry conditions in their country.—Morley A. Jull.

SEVEN WAYS TO GREATER EGG PROFIT

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Seven widely recommended production and marketing practices were studied by the U. S. Department of Agriculture in cooperation with Agricultural Experiment Stations in nine Mid-western States in an effort to determine their value in maintaining quality and toward increasing the number of top grade eggs the producer has to market. These practices and their relative worth in quality egg production, the research study indicates, made it possible for producers who followed all seven of them to market eggs that averaged 90 percent grade A quality. On the other hand, producers who followed none of the recommended practices marketed eggs that averaged only 55 percent grade A quality.

Producers, with a little extra effort, can follow the seven recommended practices with assurance that they will have more top grade A eggs to market and greater returns. These practices are: (1) Confining the laying flock, (2) providing clean, dry floor litter; (3) providing clean, dry nesting material; (4) gathering eggs frequently; (5) collecting and cooling eggs in wire baskets; (6) cooling eggs before packing and keeping them cool; (7) and maintaining proper humidity.

The effect of the use of these practices upon egg quality is shown in Figure I.

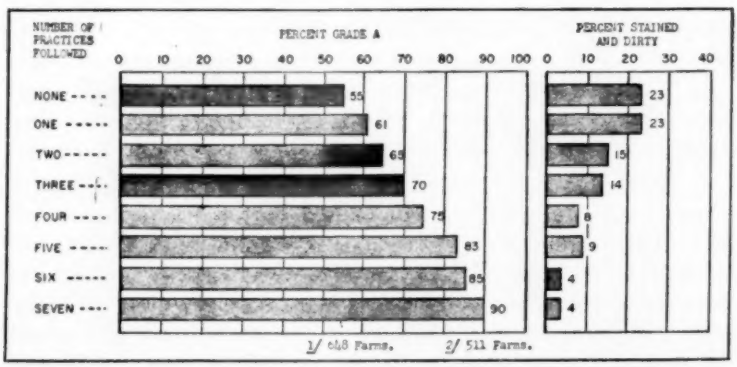

Fig. 1. Number of recommended management and handling practices followed by midwestern egg producers and percentage of eggs marketed that were (1) Grade A[1] and (2) Stained and Dirty[2].

(1) *Confining the laying* flocks is a sound, time-tested farm management practice known to result in greater production and more high quality eggs. Producers should confine laying flocks in suitable poultry houses that are well ventilated at all times. The houses should provide each layer with from 3 to 4 square feet of space. Laying hens do not produce to full efficiency without proper shelter, and lack of adequate housing is apt to result in more stained and dirty eggs as well as in low production.

Over-crowding in a poultry house is as bad a practice as that of permitting the hens to roam. A lower rate of production and a higher percentage of stained and dirty eggs are certain to result. It is a far better practice to keep no more layers in the flock than housing facilities can comfortably accommodate.

Researchers studied the methods employed on 646 farms to determine the effect upon egg quality resulting from keeping flocks confined. It was found that 174 farmers who kept their flocks confined at all times marketed eggs that averaged 78 percent A quality. On 61 farms where part-time confinement was practiced, the percentage of A quality eggs was 74 but on 411 farms where laying flocks were not confined, the percentage of A quality eggs marketed was only 66.

(2) *Providing clean, dry floor litter* is a management practice which helps provide more A quality eggs. Clean, dry litter is frequently the difference between clean eggs and stained and dirty eggs. Many types of litter are available and most are inexpensive. Spreading the litter and keeping it dry and clean reduces the chore of cleaning dirty eggs.

The effect of using dry floor litter on egg quality was examined on 498 farms. Of this total, 465 farms used dry floor litter and marketed 70 percent A quality eggs. The 33 farms that permitted floor litter to become damp marketed eggs that averaged only 57 percent A quality.

On 127 farms that supplied clean litter the eggs marketed were 78 percent A quality, but only 70 percent A quality, on 156 farms where slightly dirty litter was found. On 205 farms where dirty litter was found, the eggs marketed were only 63 percent A quality.

(3) *Providing clean, dry nesting materials* is another practice of importance to quality production and most farms have ample quantities of nesting material at hand.

According to the 9-State study, use of clean, dry nesting material is a fairly general practice among farm flock operators. On 482 farms where dry nesting materials were used, 70

percent of the eggs marketed were of A quality. On 13 farms, however, where damp nesting material was found, the eggs marketed were only 50 percent of A quality.

Clean nesting material, as provided on 314 of the farms studied, resulted in the marketing of eggs of 75 percent A quality, while the percentage dropped to 63 percent on farms where nesting material was found slightly dirty and to 52 percent where dirty nesting material was used.

(4) *Gathering eggs frequently*—at least 3 times a day—is one of the most necessary of all recommended marketing practices. The longer eggs stay in the nest after they are laid, the more they deteriorate. Exposure to sun or any heat adversely affects egg quality. Commercial egg producers usually collect eggs a minimum of three times a day, preferably at 10 a.m., between 12 and 1 p.m., and again at 4 p.m. The study indicates that egg quality may be improved by collecting eggs four times a day.

Out of 647 farms studied as to egg collection practices, only 35 farms made collections four times a day. The eggs they marketed were 84 percent A quality. On 113 farms where collections were made 3 times a day, 79 percent of the eggs marketed were A quality. On the 346 farms where collection was made twice a day the eggs marketed averaged 70 percent A grade, while on 153 farms collecting only once a day, the eggs marketed averaged only 60 percent grade A.

(5) *Collecting and cooling eggs in wire baskets* is a desirable practice. Wire baskets permit free circulation of air to cool eggs rapidly before they are packed in cases and reduces the chance of quality deterioration. Use of pails of metal or wood, boxes or woven wood baskets is not recommended for cooling. Such containers do not permit the eggs to cool rapidly enough even when they are placed in cooling rooms.

A study of this practice was made on 624 farms of which 193 operators used wire baskets and marketed 76 percent of A quality eggs. Woven wood baskets were used on 32 farms and the quantity of grade A eggs marketed averaged 70 percent, while on 399 farms on which pails or buckets were used only 67 percent of the eggs marketed were grade A.

(6 & 7) *Cooling eggs before packing, keeping them cool, and maintaining proper humidity* are practices that go hand in hand. Of first importance is placing eggs in a cooling room as soon as they are collected. A refrigerated room is ideal, of course, but cool basements, caves or spring houses are generally satisfactory. Maintenance of relatively high humidity is also important. Where natural conditions are not satisfac-

tory, other means can be used to increase the moisture in the storage place. Rapid quality deterioration is certain to follow if eggs are not properly cooled or stored.

Practices relative to the cooling and holding of eggs were studied on 614 farms. On 296 farms, it was found that cooling and storage room temperatures ranged from 50 to 69 degrees F. and that the eggs marketed averaged 72 percent grade A. On 266 of the farms where temperatures ranged from 70 to 79 degrees F. the eggs marketed averaged 66 percent grade A, and where temperatures ranged from 80 degrees F. and higher, the eggs marketed were only 55 percent grade A. (Marketing Activities, May, 1952, U.S. Dept. of Agr., P.&M.A., Washington, D.C.)

POULTRY PRODUCTION IN NIGERIA

According to Mr. Christian C. Obi, a student at Kansas State College, Manhattan, Kan., U.S.A., the production of eggs and poultry meat has not reached the stage of commercial production as yet, except with respect to guinea eggs in Northern Nigeria. Guinea eggs are distributed to all parts of the country and are sold to consumers mostly already cooked.

Although chickens are kept in all parts of the country and chicken eggs are more highly prized than guinea eggs, the incubation of chicken eggs is by the natural methods and growing stock as well as layers are obliged to forage for their living for the most part. Except for a few White Leghorns, New Hampshires, and Rhode Island Reds, most flocks are of native origin.

In Northern Nigeria, turkeys are raised, roast turkey being served on Christmas and New Year days. In Southern Nigeria, considerable numbers of ducks are raised, their eggs and meat providing protein supplements to the diet for the natives.—Morley A. Jull.

AIR SAC INFECTION IN CHICKENS

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As yet there is a great deal of confusion in the minds of the persons doing pathological work as to the specific causes of Air Sac Infection. Many causes are known, but there are cases in which the causative agent seems to be very elusive. No wonder there is confusion among the poultrymen.

This condition is very costly to the chicken grower. There is an accumulation of pus in the abdominal air sacs which is very evident. This material is also present in great quantities in the heart sac as well.

There are many conditions that produce this infection, some are Aspergillosis, Newcastle Disease, Fowl Cholera, Infectious Bronchitis and Chronic Respiratory Infection, to mention some.

Most of the causes can be identified by laboratory techniques now available in most diagnostic laboratories.

Aspergillosis is easily identified by isolation of the causative mold on artificial medium. This is done frequently in our laboratory.

Newcastle Disease can be diagnosed by a blood test in some cases, while it is necessary to isolate the virus in some cases. The virus isolation is costly and time consuming, since viruses only grow in young living tissues which are quite easily acquired in the living egg embryo and is the method used in most laboratories.

Bronchitis also must be identified by a blood test or by virus isolation.

Fowl Cholera is of relative little consequence in this disease, but is sometimes the cause of air sac infection. This is quite easily identified in the laboratory since the causative organism can be grown on artificial medium quite easily.

Chronic Respiratory infection seems to have been the disease causing the confusion. A specific virus was isolated from a very slow developing disease in one of the New England states and has been called a Chronic Respiratory infection. This is a relatively slow diesase both in spreading and recovering. The virus is rather difficult to grow in egg embryos. It is easier to grow in turkeys since sinusitis in turkeys and chronic respiratory infection in chickens may be one and the same.

When a flock of broilers is once infected with air sac infection they seem to show some respiratory symptoms as long as the flock is kept. The first symptom seen is a slight rattling, usually heard best at night. As time progresses breathing becomes more difficult, the flock goes off feed and general illness.

The combs become dark and the birds lose color. Death loss may be quite high. The high rate of mortality exists for a period of two weeks and then gradually lessens, but the remainder of the flock is generally very thin and make very poor grade carcasses.

POULTRY MANURE IS A VALUABLE FERTILIZING MATERIAL

Large quantities of poultry manure are produced each year on many Maryland farms, especially on the Eastern Shore. The excellent response of crops to applications of poultry manure proves it to be a fertilizer of high value, although it alone is not always adequate.

AVERAGE COMPOSITION OF MANURE

		Pounds in one ton of manure		
Kind of Manure	Moisture	Nitrogen	Phosphoric Acid	Potash
Poultry manure	55	20	16	8
Stable manure	86	10	5	10

LITTER

The poultry manure available for fertilizer is nearly always mixed with a litter such as straw, wood shavings, chopped corn cobs, cane pumice, peat moss or other commercial absorbent material. Of course, the type of litter will influence the composition of the manure and consequently its immediate usefulness to some extent.

LOSS OF NITROGEN

Frequently 100-200 lbs. of superphosphate is added per ton of manure to decrease loss of nitrogen. However, experimental work at the Delaware Experiment Station indicates that untreated poultry manure is just as effective in increasing crop yields of vegetable crops as poultry manure reinforced with superphosphate. On similar soils in Maryland, especially those that have received heavy applications of high phosphate

fertilizers for vegetable crops, it is doubtful if adding superphosphate will increase crop yields. Where heavy phosphate fertilization (1000-2000 lbs. per acre per year of a complete fertilizer) has not been carried on, it may be very beneficial to add phosphate to the manure.

Hydrated lime is sometimes scattered over the litter at the rate of 25 lbs. per 100 sq. ft. with a view toward conserving nitrogen and keeping the litter in a relatively dry condition. Where the built-up litter system is used, applications of 10-12 lbs. of hydrated lime per 100 sq. ft. may be scattered at intervals. Work at the Vermont Agricultural Experiment Station has shown that this practice decreases nitrogen losses for 5-7 days in warm weather (longer in cold weather), but after that period the lime has no effect in conserving nitrogen. Ground limestone has no appreciable effect in conserving nitrogen because it is too insoluble. For conservation of nitrogen, therefore, hydrated or burned lime should be applied to the litter. If the soil has been heavily limed, be careful not to overlime by applying lime with the manure.

The second table shows that the longer the manure is allowed to stand, even though protected from rain, the greater will be the loss of nitrogen. Therefore the manure should be spread and thoroughly worked into the soil as soon as possible so that the soil can absorb the ammonia given off, and so that plants can make use of the soluble nitrogen.

NITROGEN LOSSES FROM POULTRY MANURE
PROTECTED FROM RAIN

Time of Standing Days	Temperature of	Loss of Nitrogen—Pounds	
		Untreated	200 lbs. superphosphate per ton
20	69-95°	36.9	2.3
20	34-50°	16.8	4.6
60	70-80°	67.2	6.0
60	Mar.-Apr.*	33.1	15.8
40	Oct.-Nov.*	23.0	Not determined
10	May*	19.4	Not determined

* Kept in unheated barn.
Data from New Jersey Agric. Exp. Sta. Bull. No. 707

In many instances it will not be practicable nor even possible to spread the manure immediately. In such cases keep the manure in narrow, deep piles and protect it from the rain to decrease nutrient losses. Covering the surface of such piles with soil will further help conserve nitrogen.—(Extension Service, University of Maryland)

HYBRID DUCKS

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All breeds of domestic ducks except the Muscovy are descendants of the Wild Mallard. Although Mallards, and Muscovies belong to the same family, Anatidae, the Mallard belongs to the genus Anas whereas the Muscovy belongs to the genus Cairina. Naturally they belong to different species, that of the Mallard being the *platyrhyrnchos* and that of the Muscovy being the *moschata*. Therefore, from the standpoint of biological classification, the Mallard is *Anas platyrhyrnchos* and the Muscovy is *Cairina moschata*. The two varieties of Muscovies include the White Muscovy and the Colored Muscovy. Since these two species of ducks are of different origin, the question has been raised concerning the fertility of their hybrid offspring.

There is no question concerning crosses between Mallards and Muscovies producing offspring, especially since crosses between guineas and chickens and between turkeys and chickens have been known to produce offspring, although in the case of the latter cross no hybrids have actually been hatched, according to the most reliable information available. Inasmuch as chickens, guineas, and turkeys belong to three different families of birds, it is readily understood that crossing two species of ducks should produce offspring. There seems to be some question, however, as to the fertility of the hybrids.

A cross of a Mallard male mated to a Muscovy female produces progeny that has the Mallard plumage color for the most part. A cross of a domestic drake mated to a Muscovy female produces male progeny that is much larger than the female progeny and the females lay small-sized eggs. In one case a cross of an Indian Runner drake mated to a Muscovy female produced female progeny that laid almost as well as purebred Indian Runners. The cross of a Muscovy drake and an Indian Runner female produced female progeny that did not lay. Reports are to the effect that crossbred females produced no progeny when mated to Muscovy or Indian Runner drakes.

TURKEY BROILERS

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The turkey industry, like other industries, has gone through many changes in the past few years which, in most instances, has meant more economical production methods. This economy of production has provided cheaper meat to the housewife. Progress has been made to the extent that turkey meat has become a staple food in many parts of the country.

The newest and possibly the most influential factor in all this is the marketing of turkeys as fryers or broilers. Such birds usually are marketed at about nine to fourteen weeks, depending upon the breed or variety used, and weigh in the neighborhood of five to seven pounds. The Beltsville White, which is a small type bird developed by the United States Department of Agriculture, is the breed most frequently used by broiler growers, however, there are those who use White Hollands and even Broad Breasted Bronze in their broiler production. The argument given in favor of the larger breeds is that they reach a desired weight at an earlier age and also dress out a slightly heavier carcass.

Production data, as far as feed efficiency is concerned, is quite similar to that of chicken broilers. The following are average figures on production that have been obtained by growers:

Feed conversion ranges from a high of 2.8 to a low of 4.11 with most growers getting an average of 3.0.

Mortality averages 5%.

Cost per pound 27 to 30 cents.

Profit per pound 10 to 12 cents.

From an analysis of the above data it would seem possible to make approximately fifty to seventy cents per bird depending on the size of the birds at market time. Generally speaking, this is true but some growers do not make such profits even though they use essentially the same production methods as those who do realize profits.

Turkey broiler production has had a phenomenal growth since its beginning. In 1951 the production of both mature Beltsville Whites and broilers amounted to 8.3 million of the 52.8 million turkeys produced. In 1952 it is estimated that production of the Beltsville Whites may reach as high as 11 or 12 million.

Those who are interested in turkey broiler production have two questions which seem to be important since the idea is a new one. Some ask "Will turkey broilers become a permanent addition to the turkey industry?" Others ask, "Will the production of turkey broilers be a stable business?" These are typical questions of any new industry and, of course, it remains to be seen whether turkey broilers will become a stable part of the industry or just a passing fancy.

A lot depends upon the marketing. It seems to be a problem of promotion as well as distribution. The small processor can and is doing a good job on the local level but it will take a national program of promotion such as can be carried out by the large processors, if the effects of over-expansion are to be avoided. This program of promotion has already been started as is evidenced by the fact that turkey broilers are appearing in markets in small towns as well as in large cities. According to those who should know, turkey broilers will likely be sold at good prices especially the early crop.

All in all it seems that the turkey industry is headed for a big year and turkey broilers will be in for their share of the increase.

EIGHT POUND COCKEREL AT 15 WEEKS

Dr. Fred P. Jeffrey, University of Massachusetts, Amherst, Mass., U.S.A., has reported that in the Experiment Station Flock of White Plymouth Rock chickens, one cockerel weighed exactly 8 lbs. at 15 weeks of age. Such a weight at that age represents remarkably rapid growth and indicates the possibility of making further progress in developing faster-growing strains of chickens.—Morley A. Jull

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IMPROVING PAKISTAN'S POULTRY INDUSTRY

Mr. F. Skaller, Poultry Research Center, Werribee, Victoria, Australia, is visiting poultry research centers and poultry breeders in the United States on his return to Australia after spending a year in East and West Pakistan as an official advisor to the local poultry authorities. Numerous governmental poultry breeding units have been developed for the purpose of supplying farmers with improved breeding stock. —Morley A. Jull.

WORLD'S POULTRY SCIENCE LIBRARY

Reviewer: W. C. THOMPSON
Department of Poultry Husbandry
Rutgers University
New Brunswick, New Jersey

Foreword—The reviewer is very glad that he is again able to resume the reading of new books closely allied to, or a part of Poultry Science, and to continue the presentation of this section of the World's Poultry Science Journal.

In recent months the poultry literature which has reached this desk has been unusually rich in contributions to the field of Genetics, or poultry breeding. To one who is continuously studying the problems of modern poultry science it seems more and more clear that the economic success of the present-day poultry and egg industry is limited by four great groups of factors; the fowl is the production unit, the feed used to promote growth and production is the raw material, environment in all its phases vies with inheritance in affecting final results, and lastly, the human factor furnishes the plan, finances, and system and management. In such an analysis the role of the inherent quality of the fowls used in the modern poultry industry at once becomes evident. This emphasis should be born in mind as one reviews the several editions which have been made in recent months to the field of poultry breeding.

GENETICS IN THE TWENTIETH CENTURY—1951—Edited for the Genetic Society of America by L. C. Dunn, Columbia University—Published by the MacMillan Company, New York City, N.Y., U.S.A.—$5.00

Poultry Science libraries should be made as complete as possible in the major fields into which modern poultry science is divided. None will dispute the place of Genetics in the composite of sciences which we like to term poultry science.

This book of 634 pages consists of essays on the progress which has been made in the field of Genetics during the first half century of development as a distinct branch of learning. The story back of the appearance of the volume is an interesting one but space does not permit saying more than that the Genetics Society of America wished to celebrate its half-century mark by bringing together into one volume many of the most notable contributions which have been made. Twenty-six chapters by as many or more authors have been chosen. The editor has shown rare tact and a most comprehensive grasp of the field in the making of his selection for inclusion in this volume. Every library should possess this book; every geneticist should have it and read it carefully; every student should consult it regularly. It is a mile stone on the road to a more complete definition of the scope and purpose of genetics. It is not written only for the animal breeder, the

poultry breeder, the plant breeder or those interested in the improvement of the human race, it is written for them all. It is a general gathering together of the great minds in the field of Genetics. It will serve each group and many others as an invaluable reference work. Very significantly the attractive cover of this volume portrays a pod of peas. Truly from Mendel's simple observation great developments have come in fifty years.

UNDERSTANDING HEREDITY—AN INTRODUCTION TO GENETICS—1952—Richard B. Goldschmidt—Published by John Wiley and Sons, Inc., New York and Chapman and Hall Limited, London—$3.75.

Dr. Goldschmidt has been internationally well-known for his teaching and research contributions in the broad field of Genetics for many years. He has written this book while Professor Emeritus of Zoology at the University of California, Berkeley, California, U.S.A. The book is at once a scientifically sound description of our present day concept of Genetics and also an easily read explanation of the applications of the principles of Genetics.

The field of Genetics is extremely broad and on the whole complex and complicated. It is a branch of science not easily understood by laymen but it's a branch of science which must appeal to every person who wants to know why things are as they are and how changes, particularly improvements, may be made in families and races. Dr. Goldschimdt has succeeded in writing so clearly and so interestingly on the subject, as stated in the title of his book, that this offering will find infinite readers who will cordially appreciate his efforts.

The book is not too long, consisting of 228 pages divided into a dozen chapters which are followed by a statement of problems which teachers may well use as accompaniments in reading assignments in the book itself, a carefully prepared list of books on breeding for those who will care to undertake further study of the subject and a well arranged index.

The author deals at once into the history of Mendelism and into the mechanics of inheritance as they are presently understood. He seems to make the facts about heredity more simple and understood than actually they are. He commands words beautifully, he senses relationships and leads from one phase of the subject to another with such cleverness as to carry the reader on page after page without realization that he has been tackling one of the most complicated subjects in modern science.

It is the sort of book which may well be used as a reference text for all students of Genetics. It is the sort of book which will open to everyone a new and fresh understanding of Heredity.

POULTRY BREEDING—Third Edition—1952—M. A. Jull—Published by John Wiley and Sons, Inc., New York City, N.Y., U.S.A., and by Chapman and Hall Limited, London—$6.00

The name of this author has long been familiar to poultry scientists, and to practical poultry producers the world over for many years. His many and various activities in the fields of poultry science research and teachings have established for Dr. Jull a reputation which predicts unusual interest whenever new writings come from his pen. He is at present Head of the Department of Poultry Husbandry at the University of Maryland, U.S.A.

The author has completely rewritten the material which he presented in the first two editions of the same title. He has found that it was necessary to rearrange the subjects which he chose to include because of rapidly changing emphases in the field of poultry breeding in recent years. He has recognized the fact that students, investigators, and husbandmen must approach improvement of their stocks through new approaches to poultry breeding. The author has particularly indicated the necessity of a better understanding of the physiology of the fowl in order to understand more clearly the Genetics of the fowl.

This book, constituted of 398 pages, is divided into twelve significantly chosen chapters and a particularly useful index. An outstanding feature of the book consists, first, of a series of questions and problems presented at the end of each respective chapter, all of which are of tremendous aid to teachers employing this book as a text book and to general readers of the book who would, as they should, stop at the end of each chapter to ascertain whether they have or not grasped the fundamental ideas which were presented in the chapter. Each chapter is also concluded by the addition of 'selected literature references'. For example, Chapter 2 dealing with the Physiology of Reproduction furnishes 173 such references, chapter 10 on Egg Production has over 200 selected references, and chapter 11 on Egg Characters presents a similar number. This feature of the book is a potential library of greatest possible value to any user of the book.

One of Dr. Jull's associates at the University of Maryland, Dr. C. S. Schaffner, is credited by the author with the prepara-

tion of the final chapter on "Selection Methods." This new feature of the book will be warmly welcomed by practical poultry breeders especially. Throughout the text the author has made real effort not only to present a clear picture of what has been done in the field but to draw conclusions and leave suggestions as to how the vast storehouse of poultry breeding facts and figures now available may best be applied in the industry toward the end of populating the poultry flocks of the world with more efficient fowls. The stress laid upon the securing of ever more efficient fowls is well made in view of the economic conditions under which poultrymen seek to put their poultry and egg production upon an economically sound basis. Costs of production all along the line have materially risen in recent years. There are few signs that these costs will be lowered in years to come. There is every sign that the burden of insuring a profitable enterprise must largely rest on the breeders and producers of the fowls themselves.

PRINCIPLES OF GENETICS—Fourth Edition—1950—Edmund W. Sinnott—L. C. Dunn, Th. Dobzhansky—Published by McGraw Hill Book Company, Inc., New York City, U.S.A.—$5.50.

Again, poultry scientists receive valuable service through the appearance of this elaborate and profound 506-page book on Genetics. These authors have, like others, found that the subject matter of their field has changed rapidly in recent years and grown tremendously in volume; they have found it necessary to rewrite and rearrange the earlier editions of their text book in order that it might be truly serviceable to all who seek improvement in plants, animals, and humans through the forces of heredity. There are 18 well-organized and systematically arranged chapters. It is a methodical and complete text book, quite properly named. Each chapter is followed by suggested questions and problems as are lists of further references.

When compared with the three Genetics books reviewed just above it must be said that this book by Sinnott, Dunn and Dobzhansky is more technical and probably more designed for the pure scientists. No particular effort has been made to explain things to the layman or to work out the applications of the scientific findings to the poultry or any other industry, but students, readers and users of books in the field of Genetics and heredity must have sound, scientific facts available for their consideration. This book will become a mighty reference for students, teachers and research workers in Genetics and

will find its place as such. The respect in which each of the authors is held guarantees continued interest in this new edition of their comprehensive coverage of the Principles of Genetics.

POPULATION GENETICS AND ANIMAL IMPROVEMENT—1950 —I. Michael Lerner—Published by the Syndics of the Cambridge University Press, England—$5.50.

Our recent months have been dedicated in no small part to the reading of new books in the field of heredity as indicated by the titles of these first five books here reviewed. This book written by Dr. Lerner while a member of the staff at the University of California, Berkeley, California, U.S.A. is a rather profound treatise comprised of a series of essays on different phases of the subject. The subtitle of Dr. Lerner's volume is highly indicative of the interest which poultry scientists will find in it, "as illustrated by the inheritance of egg production." The authors own preface begins with the significant statement "the purpose of this book is to raise rather than to answer questions." He succeeds in stimulating minds. He builds one's natural curiosity into a forceful challenging of what is taking place in the natural world around us and as to the nature of the changes which are manifest. His title intimates that the direction of the changes which are taking place in the world on the whole work toward improvement. It is equally true that general improvement of chickens, sweet peas, or humans is made the more apparent because in the same process poor individuals are gradually eliminated and only the better specimens are used in the propagation of new generations. Of course, it would be wonderful news if one could feel that this trend were one hundred per cent in operation. Unfortunately, not in every field are poor specimens eliminated from the breeding stock; however, the trend is toward the use of an increased number of better stocks.

The poultry scientist will find Dr. Lerner's employment of poultry and egg production facts of direct interest as well as good illustrations of points made. The fifteen chapters into which 302 pages of the text are divided should be named one by one in order that one might form a complete picture of the coverage assigned to this work, but space will not permit. Suffice perhaps to say that this book adds much to our general understanding of the modern science of statistics and much to our comprehension of the significant changes in natural populations which are taking place throughout the world in these

days, because of a better general grasp of fundamental principles and their applications. The story is fascinatingly told by Dr. Lerner. His refreshing new approaches and points of view are stimulating to readers in this field.

POULTRY PRODUCTION—1952—Eighth Edition—L. E. Card—Published by Lea and Febiger—Philadelphia, Pa.—U.S.A.—$5.00.

For many years the name of Dr. W. A. Lippincott was associated with the book above named. In fact through the fourth edition published in 1927, Dr. Lippincott, Professor of Poultry Husbandry at the Kansas State College and later at the University of California, appeared as sole author. After his death the fifth, sixth and seventh editions in 1934, 1936, and 1946 respectively appeared under the joint authorship of Lippincott and Card. Now, in 1952 the eighth edition almost entirely rewritten and greatly changed in many respects appears under the sole authorship of Dr. L. E. Card, Professor of Animal Science, University of Illinois, Urbana, Illinois, U.S.A.

A reviewer is impressed first, by the job which the publishers have done as is natural in this instance; the publishers have brought out this eighth edition of "Poultry Production" in a new, very modern and most attractive binding. It is published on a very high quality art paper so that the many illustrations presented in the text are of superb quality of reproduction. Dr. Card has followed rather generally in the order of the arrangement of chapters and subjects the pattern originally set by Dr. Lippincott. However, in this eighth edition some changes in order of presentations have been made, because of changes in emphasis with the times in which we live. The author has very apparently attempted to write a book which would make a wide appeal to those who are primarily interested in and engaged in practical poultry and egg production wherever they may be throughout the civilized world. He has sought the record diligently but out of what he has found he has built a summary of conclusions and suggestions for the application of the facts of poultry science to the needs of the modern poultry industry. In earlier editions this book carried long and comprehensive lists of literature cited. These have been omitted from this edition. However, he does present a list of 25 titles which he offers as his suggestion for the building of a working poultry library. It is an excellent general text book and it is well named. Dr. Card's life work in the field of poultry science has made him well known to members of the World's Poultry Science Association in many countries. Scores

of poultry scientists and poultrymen throughout the world will look forward to an examination of this book. It becomes one of the sound and lasting records of poultry science as it is recognized and known in 1952.

THE ECONOMICS OF POULTRY MANAGEMENT—1952—Harold E. Botsford—Published by John Wiley and Sons, Inc., New York City, U.S.A., and Chapman and Hall Limited, London, England.

For very many years those of us who have been interested in trying to promote a sounder and safer poultry and egg industry have watched with admiration the services which have been rendered by Professor Botsford as an Extension Poultry worker going out from Cornell University at Ithaca, New York. His contacts over these many years have been principally with those millions of men and women who sought to earn a livelihood out of the practical production and distribution of poultry and egg products. Rare have been his opportunities to observe the problems which arise on the farms and in the hatcheries. Countless have been his talks with people who simply had to make the poultry industry a paying investment of time and capital. It will be for ever useful to the poultry industry of the world that this author has set down in most logical and readable fashion his observations on the "Economics of Poultry Management." Twenty-four chapters are dedicated to a consideration of all phases of poultry and egg production and management. 337 pages and countless splendid illustrations present the economic studies upon which this book is based. The author recognizes that the domestic hen is but one part of the modern poultry industry. He has valuable chapters on the turkey industry, on the squab industry, on the waterfowls, and on guinea production. His analyses of cost items are revealing, his suggestions for building up a scientifically sound and yet economically profitable poultry industry should be read by poultry scientists and poultry farmers alike. The text goes a long way in bringing together the points of view of pure scientists and practical producers.

The respective chapters are followed by lists of references which will, in each instance further elucidate on the subjects mentioned in the chapters. Teachers of poultry farm management have found comparatively few text books to use in this field. It is true that many general text books have carried chapters on poultry farm economics and management but here is a book dedicated in its entirety to that subject. It is a job well done.

POULTRY HUSBANDRY, LABORATORY EXERCISES FOR FARM POULTRY PRODUCTION—1952—Avery and Payne—Published by Burgess Publishing Company, Minneapolis, Minnesota, U.S.A.

These authors have seen the need which has long existed in high school and vocational school and introductory courses in Poultry Husbandry for a laboratory manual which would, in an orderly fashion, lead students to a better comprehension of what is included in the subject of Poultry Husbandry. They have provided in a semi-looseleaf type of book a series of 15 lessons which include such fundamental lessons as, "Nomenclature and Breed Identification," or "Caponizing and Dubbing Operations," or "Poultry Feeding," or "Egg Quality," or "Preparation of Poultry for Cooking," or "Poultry Diseases", to mention only a part of them. The manual is arranged to minimize the amount of rough notes which the students will have to write down. Sufficient blanks are left, however, so that the students will be required to go over all phases of each lesson. The exercises are so arranged that at the completion of the introductory course in Poultry Husbandry each student will have a practical and comprehensive statement on the jobs which are typical of those which constitute modern poultry farming.

The manual was written primarily for students in introductory courses at the Kansas State College, Manhattan, Kansas. However, the manual is full of good ideas for teachers of poultry husbandry everywhere. They can readily replace in Exercise I the study of the Kansas State College Poultry Plant with their own. The point of the lesson is to indicate how the college and Experiment Station poultry plants in the U.S.A. operate in aid of the respective segments of the poultry industry in America.

Any introductory course in Poultry Husbandry must be limited to the touching of high points only. These points must be selected and presented in such manner as to stimulate the interest and curiosity of students in the fundamentals which underlie sound, profitable poultry and egg management in these days. This manual shows a way in which young students may be made to develop a healthy curiosity into what is universally recognized as one of the most important branches in modern agriculture.

REVIEW OF POULTRY PUBLICATIONS

Compiled by J. W. Kinghorne,

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GENETICS

BELL, A. E., and J. T. BALDINI. (Purdue U., Lafayette, Ind.)
GENETIC INFLUENCE ON VARIATION IN GROWTH RATE OF CHICKS. *Poultry Sci. 30:* 906-907. 1951. *An abstract.* (Biological Abstracts)

BELL, A. E., C. H. MOORE, B. B. BOHREN, and D. C. WARREN. (Purdue U., Lafayette, Ind.)
SYSTEMS OF BREEDING DESIGNED TO UTILIZE HETEROSIS IN THE DOMESTIC FOWL. *Poultry Sci. 31:* 11-22. 1952.—Two methods of selection in poultry, recurrent selection for nicking and reciprocal selection, are descr. and compared with selection within a closed flock. The new methods are essentially selection for specific combining ability between 2 populations on the basis of the progeny test. Theoretically, they would be superior to the conventional method of closed flock selection for improving only those characteristics which are detd. by genes exhibiting some over-dominance or epistasis. Recurrent selection for nicking would be of greatest value in establishing a strain that uniformly yields maximum heterosis when combined with an existing inbred line or single cross. It would be expected to be more effective in increasing the frequencies of desirable alleles than would reciprocal selection; however, the latter method would have a higher theoretical limit of improvement. Also, reciprocal selection would be more practical for poultry since proven strain and breed crosses are available as foundation stocks. An alternative method is suggested which may be more advantageous than the above methods for applying the basic concept of selection for specific combining ability in poultry.—*Authors.* (Biological Abstracts)

BRUNSON, C. C., and G. F. GODFREY. (Oklahoma Agric. Exptl. Sta., Stillwater.)
PERFORMANCE OF RHODE ISLAND REDS, BARRED PLYMOUTH ROCKS, WHITE LEGHORNS, AND CROSSES INVOLVING THESE BREEDS. *Poultry Sci. 30:* 908. 1951. *An abstract.* (Biological Abstracts)

GHOSTLEY, F., and A. W. NORDSKOG. (Iowa State Coll., Ames.)
HYBRID VIGOR IN STRAIN CROSSING AND BREED CROSSING [IN CHICKENS]. *Poultry Sci. 30:* 914. 1951. *An abstract.* (Biological Abstracts)

GLAZENER, E. W., and W. L. BLOW. (North Carolina Expt. Sta., Raleigh.)
TOPCROSS TESTING FOR BROILER PRODUCTION. *Poultry Sci. 30:* 870-874. 1951.—Topcross matings were made by sires of 8 inbred lines. These topcrosses were compared with inbreds for 10-week broiler weight, 6-week feathering, mortality to 10 weeks, and hatch-

ability. Positive significant regressions were obtained for topcrosses on inbreds for broiler wt. and feathering; a regression value approaching zero for mortality and hatchability. These results are probably explained in part on the basis of the heritability of the characters considered. Interactions of the line X tester were calculated and found significant for broiler wts. and hatchability. The value of the topcrossing test appears limited in broiler production.—*Authors.* (Biological Abstracts)

GODFREY, GEORGE F., and G. M. FARNSWORTH, JR. (Oklahoma A and M College, Stillwater.)
RELATION OF THE SEX-LINKED RAPID FEATHERING GENE TO CHICK GROWTH AND MORTALITY. *Poultry Sci. 31:* 65-68. 1952.—Progeny from matings of Silver Oklabars, New Hampshires, and Barred Plymouth Rocks were classified for rate of feathering at 10 days of age on the basis of length of tail feathers. Body wts. and mortality rates to 10 wks. of age were related to rate of feathering on the basis of all sire families containing slow and rapid feathering birds, matings within sire families, and matings of the type Kk X k- within the Silver Oklabar breed. In the birds studied, the gene k for sex-linked rapid feathering was found to have no relation to body weight or mortality rate to 10 weeks of age. The action of the gene seems to take place in the feather follicle and is not concerned with general body growth.—*Authors.* (Biological Abstracts)

HALE, E. B. (Pennsylvania State Coll., State College.)
DIFFERENTIAL FERTILITY AND CRITERIA FOR "PREFERENTIAL MATING" IN TURKEYS. *Poultry Sci. 30:* 916. 1951. *An abstract.* (Biological Abstracts)

HAYS, F. A. (Massachusetts Agric. Expt. Sta., Amherst.)
ARE THREE HUNDRED EGG HENS SUPERIOR BREEDERS? *Poultry Sci. 30:* 917. 1951. *An abstract.* (Biological Abstracts)

HENDERSON, E. W. (Michigan Agric. Expt. Sta., East Lansing.)
INHERITANCE OF HATCHING POWER IN NINE GENERATIONS OF DARK CORNISH [CHICKENS]. *Poultry Sci. 30:* 917. 1951. *An abstract.* (Biological Abstracts)

HOWES, C. E., and F. B. Hutt. (Cornell U., Ithaca, N. Y.)
BREED RESISTANCE TO NUTRITIONAL ENCEPHALOMALACIA IN THE FOWL. *Poultry Sci. 30:* 918. 1951. *An abstract.* (Biological Abstracts)

HUTT, F. B., and R. K. COLE. (Cornell U., Ithaca, N. Y.)
HETEROSIS IN AN INTER-STRAIN CROSS OF WHITE LEGHORNS. *Poultry Sci. 30:* 918. 1951. *An abstract.* (Biological Abstracts)

JEFFREY, F. P. (U. Massachusetts, Amherst.)
PLUMAGE GENE INTERACTION IN THE DOMESTIC FOWL. *Poultry Sci. 30:* 918. 1951. *An abstract.* (Biological Abstracts)

JEROME, F. N., and J. R. CAVERS. (Ontario Agric. Coll., Guelph, Canada.)
CROSSES INVOLVING DOMINANT AND RECESSIVE WHITE IN COMBINATION WITH COLORS AND PATTERNS [IN CHICKENS]. *Poultry Sci. 30:* 919. 1951. *An abstract.* (Biological Abstracts)

KIMBALL, ELLIOT. (Clinton Expt. Farm, Clinton, Conn.)
GENETIC RELATION OF EXTENDED BLACK TO WILD TYPE PLUMAGE PATTERN IN THE FOWL. *Poultry Sci. 31:* 73-79. 1952.—The basic wild type plumage pattern factor in the fowl is gene e+, an autosomal restrictor of black melanin, allelic to E (extended black) and e (columbian restriction). The genotype (e+ e+) coincides with black plumage in both sexes, restricted to show sexually dimorphic pyle-zoning, a phenotype designated as pyle-black. Black pigments deposited in relation to activity of genes e+ and E are

genetically and physiologically distinct. Stippling (Sg) is epistatic to e+ black in the female, but hypostatic to E black in both sexes. The genotype (e+ e+) may be a genus characteristic of *Gallus*. It is recommended that e+ black be employed as standard of reference in testing dominance of secondary pattern factor alleles.—*Elliot Kimball.* (Biological Abstracts)

KING, S. C. (Cornell U., Ithaca, N. Y.)
AN INTERACTION EFFECT OF CROSSBREEDING ON EGG PRODUCTION. *Poultry Sci. 30:* 920-921. 1951. *An abstract.* (Biological Abstracts)

LERNER, I. MICHAEL. (U. California, Berkeley.)
POULTRY BREEDING. *California Agric. 5:* 15. 1951.—Most breeders of chickens who start with avg. or below avg. commercial flocks have little difficulty in obtaining improvement by selection of economic characters. Following a number of generations of improvement the rate of improvement usually slows down and may cease. Studies on shank length suggest that continued selection pressure will permit the flock to find a new favorable balance of all characters. If this is correct sufficient patience may permit the breeder to break through the ceiling that limits further improvement.—*G. W. Bohn.* (Biological Abstracts)

LERNER, I. MICHAEL, and EVERETT R. DEMPSTER. (U. California, Berkeley.)
THE THEORY OF MULTIPLE SHIFTS. *Poultry Sci. 30:* 717-722. 1951.—The method of multiple shifting of males in the course of a season of breeding operations in poultry improvement is compared theoretically with the usual single-shift method, and found to be relatively inefficient, except possibly in very small flocks where inbreeding degeneration may play an important role.—*Auth. summ.* (Biological Abstracts)

LERNER, I. MICHAEL, LEWIS W. TAYLOR, and DOROTHY C. LOWRY. (U. California, Berkeley.)
SELECTION FOR INCREASED INCIDENCE OF BLOOD SPOTS IN WHITE LEGHORNS. *Poultry Sci. 30:* 747-757. 1951.—The annual incidence of blood-spotting as detd. by ordinary commercial candling methods was found to be between 0.5 and 1.3% in a production-bred flock of S. C. White Leghorns. By selection and continued migration from this flock, a line was established in which the incidence increased progressively to about 23%. Crosses between this line and members of the parental flock exhibited intermediate incidence. The heritability of blood-spotting expressed as percent of all eggs laid which contained blood spots was found to be about 0.5. In spite of this relatively high heritability, certain economic and statistical considerations suggest that in commercial practice combined family and individual selection would be called for in the control of this defect by genetic methods. *Auth. summ.* (Biological Abstracts)

MARTIN, G. A., E. W. GLAZENER, and W. L. BLOW. (North Carolina State Coll., Raleigh.)
EFFICIENCY OF EARLY SELECTION FOR BROILER GROWTH. *Poultry Sci. 30:* 923. 1951. *An abstract.* (Biological Abstracts)

MOORE, C. H., and D. C. WARREN. (U. S. Dept. Agric., Lafayette, Ind.)
INFLUENCE OF THE COEFFICIENT OF INBREEDING ON THE VARIABILITY OF GROWTH OF TOPCROSS CHICKS. *Poultry Sci. 30:* 924. 1951. *An abstract.* (Biological Abstracts)

MUELLER, C. D. (Kansas Agric. Expt. Sta., Manhattan).
A COMPARISON OF COMMERCIAL INBRED-HYBRID CHICKENS AND FIRST GENERATION CROSSBREDS FROM NONINBRED STOCK. *Poultry Sci. 31:* 166-170. 1952.—Crossbreds from noninbred White Leghorn and heavy breed ancestors were significantly

heavier than inbred-hybrids at 8 weeks of age and at maturity. The avg. number of eggs for a 365-day laying year for surviving birds was 235.8 for inbred-hybrids and 222 for crossbreds from non-inbred ancestors, but the avg. number of eggs laid for each bird originally housed was 187.5 for the crossbreds and 186.2 for the inbred-hybrids. No significant differences were apparent between pullets from the 2 sources with respect to mortality, egg wt. shell quality, occurrence of meat and blood spots, and albumen quality. Earlier sexual maturity, less broodiness, and higher egg production were obtained for crossbreds from White Leghorn males mated to heavy breed females than were obtained for stock from heavy breed males mated to White Leghorn females.—*C. D. Mueller.* (Biological Abstracts

MUELLER, CLYDE D., and FRED MOULTRIE. (Kansas State Coll., Manhattan.)
CLASSIFICATION OF SEX-LINKED EARLY AND LATE FEATHERING IN 10-WEEK-OLD CHICKENS. *Poultry Sci. 31:* 171-172. 1952.—Chicks with sex-linked early or late feathering were classified with 100% accuracy at 10 weeks, an age at which selections for growth rate could also be effected. Late feathering chicks of this age showed no molt of the No. 2 secondary feather, and had heart-shaped tails due to the presence of short, immature main tail feathers in the medial and lateral portions, separated by longer immature juvenile feathers. Early feathering chicks were characterized at 10 weeks by molting of the No. 2 secondary feather of the juvenile plumage and by the presence of one or more mature juvenile main tail feathers in the lateral regions and immature postjuvenile plumage in the rest of the tail.—*Authors.* (Biological Abstracts)

RAPP, G. D., R. B. ARVIDSON, and B. B. BOHREN. (Purdue U., Lafayette, Ind.)
EGG SIZE: A STUDY OF SEVERAL INFLUENCING FACTORS AND A PROPOSED METHOD OF PHENOTYPE SELECTION. *Poultry Sci. 30:* 928. 1951. *An abstract.* (Biological Abstracts)

SHAKLEE, W. E., C. W. KNOX, and S. J. MARSDEN. (U. S. Dept. Agric., Beltsville, Md.)
INHERITANCE OF THE SEX DIFFERENCE OF BODY WEIGHT IN TURKEYS. *Poultry Sci. 30:* 930. 1951. *An abstract.* (Biological Abstracts)

WARREN, D. C. (U. S. Dept. Agric., Lafayette, Ind.)
POSSIBILITIES OF HYBRID POULTRY. *Poultry Sci. 30:* 932. 1951. *An abstract.* (Biological Abstracts)

WYATT, A. J. (Iowa State Coll., Ames.)
COMBINING ABILITY OF FIVE INBRED LINES OF LEGHORNS. *Poultry Sci. 30:* 934. 1951. *An abstract.* (Biological Abstracts)

PHYSIOLOGY

ADAMS, JOHN L., L. E. CASIDA, and W. H. McGIBBON. (U. Wisconsin, Madison.)
SOME CHARACTERISTICS OF EGGS FROM ESTROGEN-FED PULLETS. *Poultry Sci. 30:* 694-700. 1951.—The eggs from Single Comb White Leghorn pullets which had been fed levels of dianisylhexene and dienestrol diacetate in the rations ranging from 0.01% to 0.04% were examined. Egg weight, yolk weight, occurrence of misshapen eggs, body checks, meat spots and percent thick albumen were not affected significantly by estrogenic treatment. The incidence of cracked eggs, soft shells, double yolks, blood spots and mottled yolks were all significantly increased and shell thickness decreased in the first expt. A 2d expt. using a predominantly different strain of birds with lower egg production and treatment beginning at a later age did not show any significant

effects although the trend in some cases supports the results in the first experiment.—*Auth. summ.*

ADAMS, JOHN L., W. H. McGIBBON, and L. E. CASIDA. (U. Wisconsin, Madison.)
THE FERTILITY AND HATCHABILITY OF ESTROGEN-FED PULLETS AND CARRY-OVER EFFECTS ON THEIR PROGENY. *Poultry Sci. 30:* 707-712. 1951.—Two synthetic estrogens, dianisylhexene and dienestrol diacetate were fed to Single Comb White Leghorn pullets at levels of 0.01% and 0.04% of the ration. No consistently significant effects were detected on fertility, hatchability, growth or mortality, but there was evidence that the presence of abnormal amts. of estrogen in the egg during incubation resulted in reproduction abnormalities in pullets and delayed sexual maturity in both sexes. No corresponding gross structural abnormalities were observed in males, but an unexplained increase in testis size of males from treated hens was noted.—*Auth. summ.* (Biological Abstracts)

ANDERSON, G. W., J. D. CUNNINGHAM, and S. J. SLINGER. (Ontario Agric. Coll., Guelph, Canada.)
EFFECT OF VARIOUS PROTEIN LEVELS AND ANTIBIOTICS ON THE INTESTINAL FLORA OF CHICKENS. *Poultry Sci. 30:* 905. 1951. *An abstract.* (Biological Abstracts)

BAILEY, R. L., and R. E. PHILLIPS. (Iowa State Coll., Ames.)
GONADOTROPHIC POTENCY OF AVIAN BLOOD SERUM *Poultry Sci. 31:* 68-71. 1952.—The gonadotropic potency of avian blood serum was detd. for chickens of different ages. The serum precipitate was injd. into male chicks (7-14 days of age) and the degree of response was measured by changes in testicular weight. The material precipitated from 30 cc. of serum from young chickens produced a testicular growth response equal to that caused by injecting the assay chicks with 10.5 r.u. of a commercial hormone product. When the birds were of comparable age, the sex of the donor had no affect on the gonadotropic potency of the serum, but the serum precipitate from 30 cc. of blood taken from non-laying hens was more potent than that obtained from laying hens. This would indicate that there is considerable variation in the concn. of the factors responsible for the gonad stimulating properties of avian blood.—*R. E. Phillips.* (Biological Abstracts)

BLAKELY, R. M., R. W. ANDERSON, and H. I. MacGREGOR. (Dominion Exptl. Sta., Swift Current, Sask., Canada.)
THE ESTROGEN INTERRUPTIONS OF BROODINESS IN TURKEYS. *Poultry Sci. 30:* 907. 1951. *An abstract.* (Biological Abstracts)

CANFIELD, T. H. (U. Minnesota, St. Paul.)
SEX DETERMINATION OF TURKEY POULTS. *Poultry Sci. 31:* 54-56. Illus. 1952.—Day-old poults are examined by everting the ventral portion of the cloaca. The male has paired, hemi-ellipsoidal shaped genital eminences which are very prominent as they protrude from just within the ventral border of the cloaca with one on each side of the median line. In the female the paired eminences are flat in appearance and they do not protrude nearly so prominently as in the male. —*T. H. Canfield.* (Biological Abstracts)

CULTON, T. G., D. W. MacLAURY, and W. M. INSKO, JR. (Kentucky Agric. Expt. Sta., Lexington.)
THE INFLUENCE OF RATE OF PRODUCTION AND TEMPERATURE ON EGG SHELL COLOR. *Poultry Sci. 30:* 815-817. 1951. —Shell color was observed on 963 eggs laid in a 28-day period by 61 hens. Thirty of the hens were in batteries and 31 were in floor pens. Shell color was studied in relation to current temp., taken on the day the egg was formed, and current production, taken as the number of eggs laid in a 28 day period. The highest single correlation (–0.3833) was

between daily temp. range and shell color. The highest multiple correlation (0.4387) was obtained with the independent variables of daily minimum temp., daily maximum temp., and production.—*Auth. summ.* (Biological Abstracts)

DEUEL, HARRY J. JR., J. GANGULY, B. KENNETH KOE, and L. ZECHMEISTER. (U. So. California, Los Angeles.)
STEREOISOMERIZATION OF THE POLYCIS COMPOUNDS, PRO- γ -CAROTENE AND PROLYCOPENE IN CHICKENS AND HENS. *Arch. Biochem. and Biophys. 33:* 143-149. 1951.—Relatively large amounts of the polycis compounds, pro-gamma-carotene and prolycopene were administered to chicks or hens. About 80% of the pigment was destroyed, and the rest occurred mainly in the feces. Far-reaching bio-stereoisomerization took place that yielded all-trans and some neoforms of the compound administered, besides polycis isomers, in part possessing more cis double bonds than the starting material. Some observations on the behavior of all-trans-lycopene in chicks are reported. —*G. Kalnitsky.* (Biological Abstracts)

GARREN, HENRY W., and C. S. SHAFFNER. (U. Maryland, College Park.)
THE EFFECT OF TEMPERATURE AND TIME OF STORAGE ON THE FERTILIZING CAPACITY OF UNDILUTED FOWL SEMEN. *Poultry Sci. 31:* 137-145. 1952.—The optimum storage temp. was 10°C. at which a practical storage period of 6 hrs. was found possible. Storage at 15°C. was practical for 3 to 4 hrs. Semen stored beyond 90 min. at 20°, 30°, or 40°C. resulted in negligible fertility. The fertilizing capacity of sperm stored at 0°C. or 5°C. dropped sharply after a few min. at these temps., yet motility was best maintained at these levels. There was evidence that sperm lowered quickly to 0°C. suffered temp. shock. Gradually changing the temp. seemed to lessen the effects of this condition. Hens inseminated with stored semen did not remain fertile for so long a time after a single insemination as did those inseminated with fresh semen. The fertility of the groups inseminated with stored semen was increased by either increasing the quantity of semen used per bird or the frequency of insemination.—*Auth. summ.* (Biological Abstracts)

GERICKE, A. M. (Pretoria University, Pretoria, S. Africa.)
FEATHER GROWTH AND MOULTING IN POULTRY. *Farming in South Africa 27:* 311. 61-67, 1952.—Factors influencing feather growth and moulting are discussed. Records kept of White Leghorns and Black Australorps revealed a corresponding increase in the average live weight and the percentage of body feathers from 4 to 8 weeks of age. In both breeds the percentage of feathers was greater in females than males.—*A. M. Gericke.*

GODFREY, EDWARD F., and R. GEORGE JAAP. (Ohio State U., Columbus.)
EARLY DETECTION OF FERTILITY IN TURKEY EGGS. *Poultry Sci. 31:* 185-187. 1952.—By the utilization of the concentrated light of a combination direct and opaque projector ("Baloptican"), or an ordinary 35 mm. film projector, it was found possible to detect fertility in turkey eggs after 22-30 hrs. of incubation. At this stage of development the turkey embryo appears before the candle as a moderately dark spot 6-8 mm. in diam. Accuracy ranged from 80 to 94%, with very few fertile eggs being classified as infertiles; errors were primarily those of classifying fertile eggs as infertiles.—*E. F. Godfrey.* (Biological Abstracts)

GORDON, R. F., and J. G. PHILLIPS.
POULTRY PRODUCTION AND PROGENY TRIALS: REPORT OF THE RESULTS OF THE ARTIFICIAL INSEMINATION CARRIED OUT AT THE POULTRY RESEARCH STATION OF THE ANIMAL HEALTH TRUST FROM MARCH TO APRIL 1951. *Vet. Rec. 63:* 503-507. 1951.—Artificial insemination can be successfully carried

out in poultry. A semen dilution of 1:2 and an inseminating dose of 0.1 cc. should yield a fertility of over 50%. The condition of the female plays an important part in fertility. Considerable figures are given using different semen dilutions and volumes.—*D. E. Jasper.* (Biological Abstracts)

GODFREY, E. F., and R. G. JAAP. (Ohio State U., Columbus.)
SOME EFFECTS OF SEX HORMONES ON BONE DEVELOPMENT AND GROWTH IN CHICKENS. *Poultry Sci. 30:* 915. 1951.—*An abstract.* (Biological Abstracts)

GOWE, R. S., and J. R. HOWES. (Central Exptl. Farm, Ottawa, Ontario, Canada.)
THE EFFECT OF THE ADDITION OF L-THYROXINE TO FOWL SEMEN. *Poultry Sci. 30:* 915-916. 1951.—Thyroxine lowered the survival time of spermatozoa in the oviducts. (Biological Abstracts)

HAYS, F. A. (Massachusetts Agric. Expt. Sta., Amherst.)
THE RELATION OF AGE AT SEXUAL MATURITY TO SOME DEVELOPMENTAL CHARACTERS. *Poultry Sci. 30:* 723-726. 1951.—The influence of age at sexual maturity in 1859 Rhode Island Red pullets was studied in relation to such developmental characters as increase in weight from housing to mature wt., mature body wt., subsequent mortality, increase in wt. after sexual maturity and annual egg production. The association between wt. at first egg and subsequent mortality was also examined. The data seem to support the following deductions: The onset of sexual maturity definitely tends to retard subsequent rate of growth in pullets. The increase in wt. from sexual maturity to mature wt. depends directly on the time interval involved. Age at sexual maturity had but a very slight positive effect on mature body wt. There was no relation between age at sexual maturity and subsequent mortality. Body wt. at sexual maturity showed no relation to subsequent mortality. Age at 1st egg had a very significant effect on 1st year egg production.—*Auth. summ.* (Biological Abstracts)

HAYS, F. A. (Massachusetts Agric. Expt. Sta., Amherst.)
EVIDENCE THAT EARLY SEXUAL MATURITY MAY INCREASE EARLY GROWTH RATE IN RHODE ISLAND RED PULLETS. *Poultry Sci. 30:* 775-777. 1951.—The data presented in 528 Rhode Island Red pullets hatched the same year indicate that very early sexual maturity is significantly associated with rapid early growth at least up to the broiler age of 12 wks. It is reasonable to assume that the same relationship will hold in males when there is no accurate measure of sexual maturity. Previous studies indicate that the different age groups actually represent genetic types. There is considerable evidence to indicate that the very early maturing pullets carry a sex-linked gene for early sexual maturity that supplements the ordinary autosomal gene for early maturity giving an age range below 190 days under exptl. conditions. Even though extreme early sexual maturity is not considered desirable in flocks bred primarily for egg production, because of the smaller body wt. at sexual maturity and its association with smaller egg size, there appears to be an advantage in producing broiler chicks from extra early maturing stocks because of their more rapid early growth. (Biological Abstracts)

HAYS, F. A. (Massachusetts Agric. Expt. Sta., Amherst.)
RATE OF CHICK FEATHERING AND GROWING CHICK WEIGHT IN RHODE ISLAND REDS. *Poultry Sci. 30:* 866-869. 1951.—In a large group of Rhode Island Red chicks hatched in the spring of 1950 from a large flock bred primarily for high fecundity, a study was made on the possible relations between degree of chick feathering up to 8 wks. of age and body weight at 8 wks. and at 12 wks. The data clearly demonstrate that the sex-linked gene sl has no effect on body wt. in early growing stages. There is very good evidence, however, that the autosomal gene X is associated with rapid growth. A sex difference in the association between degree of back feathering at 8 wks. and body

wt. at 8 and 12 wks. appears to be due to the supplementary effect of the sex-linked gene on back feathering. Since females can never carry more than one gene sl while males may carry 2, it is obvious that degree of back feathering is more dependent on the autosomal gene X in females than in males. The expected result would be a closer association between degree of back feathering and wt. in females than males as our data indicate. In developing a broiler strain for superior growth it would appear necessary to make selections for complete back feathering at 8 wks. of age.—*F. A. Hays.* (Biological Abstracts)

HEGSTED, D. M., DORIS WILSON, JEAN P. MILNER, and PATRICIA H. GINNA. (Harvard U., Boston.)
BLOOD AND PLASMA VOLUME AND THIOCYANATE SPACE OF NORMAL CHICKS. *Proc. Soc. Exptl. Biol. and Med. 78:* 114-115. 1951.—Blood and plasma volumes determined with Evans blue dye and thiocyanate space are reported for chicks from 13 to 35 days of age. The mean values as per cent of body weight are: plasma vol., 6.6; blood vol., 9.6; and thiocyanate space, 43.3. (Biological Abstracts)

HENDERSON, EARL W. (Michigan State Coll., E. Lansing.)
VARIATION IN HATCHING POWER BETWEEN STRAINS OF THE DARK CORNISH AND THE SINGLE COMB WHITE LEGHORN BREEDS. *Michigan State Coll. Agric. Expt. Sta. Quart. Bull. 33:* 401-405. 1951.—Hatchability in the 1950 season of 3 lines of Cornish was as follows: line 1, 79%; line 2, 88%; line 3, 86%; average of all Cornish, 85%. Hatchability of the White Leghorns was as follows: line 1, 91%; line 2, 94%; line 3, 91%; average of all Leghorns, 92%. The difference between breeds was statistically significant(at the 1% level.) All flocks had the same nutritional and environmental opportunity and the eggs were set in the same incubator.—*E. W. Henderson.* (Biological Abstracts)

HERRICK, E. H. (Kansas State Coll., Manhattan.)
THE INFLUENCE OF ANDROGENS IN A FEMALE TURKEY. *Poultry Sci. 30:* 758-759. 1951.—A female turkey some 6 months of age was given 8 mg. of testosterone propionate twice weekly for more than 6 mos. The skin about the head became reddened and thickend until the appearance was that of an adult male. The "beard spot" became much thickened but there was little growth of the beard. The manner of strutting and vocalization were indistinguishable from an adult male. The ovary was atrophic.—*E. H. Herrick.* (Biological Abstracts)

GRIDDLE, JOY E., and AGNES FAY MORGAN. (U. California, Berkeley.)
THE EFFECT OF TOCOPHEROL FEEDING ON THE COMPOSITION OF TURKEY TISSUES. *Proc. Soc. Exptl. Biol. and Med. 78:* 41-46. 1951.—Tocopherols, chiefly alpha, were fed to 28 turkeys at levels of 0.01 to 2% of the feed 2.5 to 35 days before slaughter. Measurable increases in the tocopherol content of liver, heart, gizzard and muscle resulted. The 0.1% level for 35 days produced the most efficient transfer of tocopherol but the total amt. of the supplement retained was very small. Bioassay of liver and leg muscle indicated presence of alpha-tocopherol within 10% of the chemically detd. amts. The peroxide numbers of skin and abdominal fat and degree of rancidity before and after frozen storage for 3 to 9 mos. were progressively greater with storage and decreasing amts. of tissue tocopherol.—*A. F. Morgan.* (Biological Abstracts)

KIRSHNER, NORMAN, G. H. PRITHAM, G. O. BRESSLER, and STEPHEN GORDEUK, JR. (Pennsylvania State Coll., State College.)
COMPOSITION OF NORMAL TURKEY BLOOD. *Poultry Sci. 30:* 875-879. 1951.—The blood and sera of 28 hen and 22 tom turkeys of the White Holland var. were analyzed for 12 components. The avg. values for amino acid N, uric acid, non-protein N, glucose, Na, Ca, and Cl were higher than those reported for man, while the values for total creatine plus creatine and for cholesterol were lower. Significant differences were found between hens and toms for Cl, cholesterol, creatine,

uric acid, glucose, and amino acid N. An all-glass modification of the Folin-Svedberg distillation apparatus for urea was devised.—*G. H. Pritham.* (Biological Abstracts)

KOSIN, I. L., M. S. MITCHELL, and W. T. BURROWS. (State Coll., Washington, Pullman.)
INFLUENCE OF TEMPERATURE ON THE REPRODUCTIVE PERFORMANCE OF THE BROAD BREASTED BRONZE TOMS. *Poultry Sci. 31:* 180-182. 1952.—The fertilizing capacity of Broad Breasted Bronze males was improved by preconditioning them prior to mating in a room kept at 65°F. This early effect persisted during the subsequent breeding period, particularly when the mating pen itself was maintained at that temp. The hatchability of fertile eggs laid by hens in an uninsulated pen and mated to heat preconditioned toms was also higher than that of similarly treated hens mated to "non-conditioned" toms.—*Authors.* (Biological Abstracts)

KOSIN, I. L., EMILE ST. PIERRE, and ROBERT McLAUGHLIN. (State Coll. Washington, Pullman.)
THE PREVALENCE OF EARLY EMBRYONIC MORTALITY IN THE BROAD BREASTED BRONZE TURKEYS. *Poultry Sci. 30:* 805-814. Illus. 1951.—On the basis of a macroscopic examination of broken out Broad Breasted Bronze hatching eggs, classified by candling as "infertile" following 7-10 days of incubation, about 18% of the germ discs were found to show unmistakable signs of development. Moreover, when 43 germ discs adjudged to be infertile by gross and by superficial microscopic examinations were studied histo-cytologically, evidence of early development was found in 39 discs. It is suggested that these blastoderms were cases of pre-ovipositat mortality. On the basis of these data, it would appear that under avg. conditions in the mass mated Broad Breasted Bronze flocks, the question of low fertility largely resolves itself into that of high incidence of early embryonic mortality.—*Auth. summ.* (Biological Abstracts)

LAMOUNIER, ROMEU DINIZ, PAULO de CARVALHO PEREIRA, and FERNANDO ANDREASI.
O METODO DE SAHLI NA DETERMINACAO DA HEMOGLOBINA EM FRANGOS NEW HAMPSHIRE. [DETERMINATION OF HEMOGLOBIN IN NEW HAMPSHIRE CHICKENS BY THE SAHLI HEMOGLOBINOMETER.] *Rev. Fac. Med. Vet. Univ. Sao Paulo 4:* 375-381. 1950.—After correcting readings of the Sahli hemoglobinometer for a small error which was believed to exist in comparison with chemical detns. of oxyhemoglobin, the following hemoglobin values were reported: in 11 cockerels, 58-60 days old, Hb varied between 7.4 and 10.0 g/100 cc. of blood, mean, 8.8; in 25 pullets of the same age, between 7.2 and 10.4, mean, 8.6; in 26 cockerels, 88-90 days old, between 9.3 and 10.7, mean, 10.1; and in 40 pullets of the same age, between 7.6 and 11.5, mean, 9.6. —*H. A. Smith.* (Biological Abstracts)

LANE, R. P., J. H. QUISENBERRY, J. R. COUCH, and S. O. BROWN. (Texas A. and M. Coll., College Station.)
EFFECTS OF FEEDING CERTAIN HORMONES ON GROWTH AND MARKET QUALITY OF POULTRY; RESULTS OF BIOLOGICAL TESTS FOR HORMONAL RESIDUE. *Poultry Sci. 30:* 921. 1951.—*An abstract.* (Biological Abstracts)

LONG, E., and G. F. GODFREY. (Oklahoma Agric. Expt. Sta., Stillwater.)
A COMPARISON OF THE MATING ACTIVITY OF DUBBED AND UNDUBBED MALES [CHICKENS]. *Poultry Sci. 30:* 922. 1951. *An abstract.* (Biological Abstracts)

McCARTNEY, MORLEY G. (Pennsylvania State Coll., State College.)
THE PHYSIOLOGY OF REPRODUCTION IN TURKEYS. 1. EFFECT ON METHOD OF MATING ON FERTILITY AND HATCHABILITY. *Poultry Sci. 30:* 658-662. 1951.—The fertility, hatchability and poult production of White Holland turkey pullets were determined

during a 24-week breeding season. Fertility was significantly improved by artificial insemination either alone or in conjunction with natural mating. During the breeding period following the onset of mating, the fertility of the naturally mated females was 81.3%, while that of the artificially inseminated females and the combination mated females was 91.7% and 95.7%, respectively. The 3 methods of mating did not greatly influence the percentage hatchability of fertile eggs. However, the combination mated females produced an avg. of 14.4 and 8.5 more poults during the hatching period than did the naturally mated or the artificially inseminated females, respectively. The 3 methods of mating had no effect on egg production.—*Auth. summ.* (Biological Abstracts)

McCARTNEY, MORLEY G. (Pennsylvania State Coll., State College.)
THE PHYSIOLOGY OF REPRODUCTION IN TURKEYS. 2. DEGREE AND DURATION OF FERTILITY AND HATCHABILITY IN BROODY AND NON-BROODY PULLETS. *Poultry Sci. 30:* 663-667. 1951.—Data were obtained on 8 broody and 11 non-broody White Holland turkey pullets that were in production at the beginning and end of a 10-week period following a single insemination with 0.05 ml. of undiluted pooled semen. There was no significant difference in either degree or duration of fertility and hatchability between these 2 groups of birds. Combined fertility, hatchability and embryonic mortality data of the 2 groups of females show that about 90% fertility and 80% hatchability of fertile eggs was maintained for 6 wks. and 7 wks, respectively, following a single insemination. Embryonic mortality data show that no excessive deaths occurred in turkey embryos fertilized by sperm 7 wks. or less of age. However, eggs fertilized by sperm that had spent more than 7 wks. in the oviduct terminated their embryonic development 7 days earlier than did those fertilized by younger sperm.—*Auth. summ.* (Biological Abstracts)

MIGICOVSKY, B. B., and A. M. NIELSON. (Dept. of Agric., Ottawa, Canada.)
CALCIUM ABSORPTION AND VITAMIN D IN THE CHICK. *Arch. Biochem. and Biophys. 34:* 105-111. 1951.—In chicks the amount of Ca^{45} which appears in the tibia after an intramusc. injn. of $Ca^{45}Cl_2$ is directly proportional to the quantity injd., or to the concn. of Ca^{45} in the tissue fluid. In view of this fact, the amt. of Ca^{45} appearing in the tibia after a definite period of time following an oral dose is used as an estimate of the rate of Ca absorption. This estimate can be employed to test the effect of various agents on Ca absorption, if the agent does not materially affect the fate of an intramusc. dose, as is the case with vit. D in chicks. The absorption of Ca is a sensitive criterion of response to vit. D. A single dose of 10 U. elicits a response in a 3-day old chick. Vit. D exerts its effect on the absorption of Ca within 30 min. after Ca admn. The presence of excess phosphate in the gut does not interfere with the absorption of a Ca dose.—*B. B. Migicovsky.* (Biological Abstracts)

OLSEN, M. W. (U. S. Dept. Agric., Beltsville, Md.)
EARLY-OVARIAN FERTILIZATION IN THE FOWL. *Poultry Sci. 30:* 925. 1951. *An abstract.* (Biological Abstracts)

OLSEN, M. W., and S. J. MARSDEN. (U. S. Dept. Agric., Beltsville, Md.)
OFF-SEASON MOLTING IN TURKEY MALES. *Poultry Sci. 30:* 925. 1951. *An abstract.* (Biological Abstracts)

PARRISH, D. B., R. N. WILLIAMS, and P. E. SANFORD. (Kansas State Coll., Manhattan.)
THE STATE OF VITAMIN A IN LIVERS AND UNABSORBED YOLKS OF EMBRYONIC AND NEWLY HATCHED CHICKS. *Arch. Biochem. and Biophys. 34:* 64-66. 1951.—The % of vit. A as ester increased in yolks during incubation. Vit. A of livers and of unabsorbed yolks of 18-day-old embryos and newly hatched chicks was principally the ester.—*D. B. Parrish.* (Biological Abstracts)

PASVOGEL, M. W., A. V. NALBANDOV, and H. W. NORTON. (U. Illinois Urbana.)
RELATIONSHIP BETWEEN COMB GROWTH IN THE MALE AND EGG PRODUCTION IN THE SIBS. *Poultry Sci. 30:* 926. 1951. *An abstract.* (Biological Abstracts)

PETERSON, D. W. (U. California, Berkeley.)
EFFECT OF SOYBEAN STEROLS IN THE DIET ON PLASMA AND LIVER CHOLESTEROL IN CHICKS. *Proc. Soc. Exptl. Biol. and Med. 78:* 143-147. 1951.—When either mixed soybean sterols or purified sitosterols were mixed with cholesterol and cottonseed oil and included in the diet of White Leghorn chicks, the plasma and liver levels of cholesterol obtained were markedly lower than when cholesterol alone was mixed with cottonseed oil and added to the diet. The possibility is discussed that one or more of the constituents of the mixed soybean sterols interferes with the absorption of cholesterol.—*D. W. Peterson.* (Biological Abstracts)

PHILLIPS, R. E. (Iowa State Coll., Ames.)
EFFECT OF FEMALE SEX HORMONE TREATMENT ON TURKEY BREEDING HENS. *Poultry Sci. 30:* 927. 1951. *An abstract.* (Biological Abstracts)

QUIGLEY, GEORGE D., and MARY JUHN. (U. Maryland, College Park.)
A COMPARISON OF SPUR GROWTH IN THE COCK, SLIP, AND CAPON. *Poultry Sci. 30:* 900-901. 1951.—A comparison was made of the spur lengths in cockerels, slips and capons at 9, 11 and 14 wks. of age. Caponization and partial castration was done at 6 weeks. The capon spur was the longest and the cockerel spur the shortest at all ages. Gradual changes in spur shape at these same ages were determined by the ratio between the calculated means for the L and T axes of the spur base. X-Ray photographs of the spurs of a separate number of one-year old birds showed the same relations found among the younger groups. Both the total spur length and the length of the central calcified core were greatest in the capon and least in the cock.—*Mary Juhn.* (Biological Abstracts)

RIGDON, R. H., J. C. RUDE, and J. G. BIERI. (U. Texas Med. Br., Galveston.)
EFFECT OF HYPERVITAMINOSIS AND HYPOVITAMINIOSIS A ON THE SKELETON OF A DUCK. *Arch. Pathol. 52:* 299-314. 1951.—The effects of hypovitaminosis and hypervitaminosis A were studied in the duck. Birds failed to gain normally when fed a ration deficient in vit. A and also when fed a standard ration supplemented with a large amount of vit. A. Ducks fed the latter ration showed a diminution in the amt. of pigment within the skin of their feet and legs. A decrease was found in the amt. of carotene in the serum of ducks fed 100,000 U. of vit. A when they were compared with those fed 25,000 U. of vit. A. No significant pathologic or roentgenographic changes were observed in the bones of the extremities of ducks fed either the vit.-A-deficient rations supplemented with vit. A or the standard ration supplemented with large amts. of vit. A. It was concluded that the effects of hypovitaminosis and hypervitaminosis A in the duck are different from those which have been described by others in the rat, the guinea pig and the dog.—*R. H. Rigdon.* (Biological Abstracts)

ROBBLEE, A. R., A. B. MORRISON, and D. R. CLANDININ. (U. Alberta, Edmonton, Canada.)
THE USE OF THIOURACIL AND DIETHYLSTILBESTROL FOR FINISHING TURKEYS. *Poultry Sci. 30:* 772-774. 1951.—Thiouracil and diethylstilbestrol alone or in combination may be expected to improve the market quality of half-grown Broad Breasted Bronze toms. The addition of thiouracil to the diet resulted in some increase in fat deposition and a slight decrease in the numbers of pin feathers. However, stilbestrol alone or in combination with thiouracil was more effective in

improving fat deposition and in decreasing the number of pin feathers on the dressed carcass than was thiouracil alone. (Biological Abstracts)

ROBERTS, E., and H. M. SCOTT. (Illinois Agric. Expt. Sta., Urbana.)
EFFECT OF LENGTH OF TIME EGGS ARE HELD BEFORE INCUBATION ON THE VITALITY OF CHICKS. *Poultry Sci. 30:* 928-929. 1951. *An abstract.* (Biological Abstracts)

ROSENBERG, M. M., and T. TANAKA. (U. Hawaii, Honolulu, T.H.)
EGG SHELL COLOR AND HATCHABILITY. *Poultry Sci. 30:* 713-716. 1951.—Eighteen pullets of a wide range of egg shell color were mated to 2 New Hampshire males. Non-significant correlation coefficients of –0.3275 and –0.4609 were obtained between shell color and hatchability with the 2 males, respectively. It was concluded that shell color has no direct bearing on hatchability.—*D. C. Hill.* (Biological Abstracts)

ROSENBERG, M. M., and T. TANAKA, (U. Hawaii, Honolulu, T. H.)
EFFECT OF TEMPERATURE ON EGG WEIGHT IN HAWAII. *Poultry Sci. 30:* 745-747. 1951.—No adverse effects on egg wt. were observed under climatic conditions where the max. daily temps. ranged around 80°F. throughout the year. The egg wt. curves agreed closely with those reported for latitudes 43° to 46° N. The data suggest that moderately high temps. alone do not adversely affect egg wt.—*D. C. Hill.* (Biological Abstracts)

RUBIO PAREDES, JESUS. (Fac. Vet., Madrid.)
ACCION DEL TIROIDES SOBRE LA ACTIVIDAD SEXUAL Y GONADICA EN LAS AVES. (COMUNICACION PREVIA.) [EFFECT OF THE THYROID ON SEXUAL AND GONAD ACTIVITY IN FOWLS. PRELIMINARY NOTE.]*An. Soc. Vet. Zootecnia* [*Madrid*] *5:* 33-36. 1951.—In poultry of the Castelana Negra breed, partial and total ablation of the thyroid gland was carried out at different ages. Statistics are given in regard to growth, egg-laying, and sexual activity of the males. Delay in sexual activities corresponds to the age at which the thyroid was operated on, and the amt. removed, that is, the presence of the thyroid is necessary for normal sexuality. (Biological Abstracts)

SHIRLEY, RAY L., J. CLYDE DRIGGERS, JOHN McCALL, GEORGE K. DAVIS, and N. R. MEHRHOF. (U. Florida Agric. Expt. Sta., Gainesville.)
EXCRETION AND RETENTION OF P^{32} AND Ca^{45} BY LAYING HENS. *Poultry Sci. 30:* 730-734. 1951.—Six hens excreted an avg. of 50.4% of the Ca^{45} dose, and 4 hens excreted an avg. of 52.8% of the P^{32} dose in up to 130 days after dosage. About 90% of the excretion of the isotopes occurred during the first 4 days after dosage. No Ca^{45} could be detected in the excrement beyond 45 days after dosage and no P^{32} 65 days after dosage. At approx. 130 days after dosage the hens contained Ca^{45} in the femur, tibia, breast bone, vertebra and pubis in the range of 0.01-0.05% per gram of tissue. The turnover of Ca^{45} between 10 and 130 days after dosage was slightly greater than that of P^{32} in the femur, tibia, breast bone and vertebra, but in the pubis was approx. 90% compared to 100% turnover of P^{32}. Leg and breast muscle, liver, heart, brain, uterus, proventriculus, alimentary contents, blood, shell, and yolk and white contained no detectable amts. of P^{32} and only a few samples of muscle, liver, and egg contained measurable amts. or traces of Ca^{45} at 130 days after oral dosage.—*G. K. Davis.* (Biological Abstracts)

STADELMAN, W. J. (State Coll. Washington, Pullman.)
USE OF DIETHYLSTILBESTROL AND THIOURACIL FOR IMPROVING FINISH OF TURKEYS. *Poultry Sci. 30:* 931. 1951. *An abstract.* (Biological Abstracts)

STADELMAN, W. J., R. KRUISWYK, and W. B. DOCKSTADER. (State Coll., Washington, Pullman.)
SOME EFFECTS OF DIETHYLSTILBESTROL ON TURKEY HENS. *Poultry Sci. 31:* 182-184. 1952.—Broad Breasted Bronze turkey

hens were implanted with 24 mg. of diethylstilbestrol 4 wks. prior to marketing. Implanting was done in June at the end of the normal breeding season. The treated turkeys stopped egg production almost completely 12 days after implantation. Controls continued to lay at approx. the same rate throughout the 28-day period. There was considerable improvement in fleshing appearance on the treated hens as compared with control birds. The pin-feather score was about equal for the treated and untreated turkey breeder hens. It was a satisfactory procedure for improving the finish of breeding hens, but the degree of improvement in finished grade did not warrant the additional expense of such treatment since it was necessary to feed treated hens for over 2 wks. with no eggs produced.—*W. J. Stadelman.* (Biological Abstracts)

SWICKARD, MARY T., ELAINE H. MONTAGUE, and ELSIE F. DOCHTERMAN, and STANLEY J. MARSDEN. (U. S. Dept. Agric., Washington, D. C.)

PALATABILITY OF EXPERIMENTAL ESTROGEN-TREATED TURKEY FRYERS. *Poultry Sci. 31:* 126-129. 1952.—Estrogen treatment of 11-, 13-, and 15-week-old male turkey fryers 3 weeks before slaughter had no significant effect on tenderness, moistness, turkey flavor, and off-flavor of the flesh of braised birds, but emphasized off-flavors in the skin. The diet contained 7.5% menhaden fish meal and 0.5% A and D feeding oil.—*Mary T. Swickard.* (Biological Abstracts)

TANAKA, T., and M. M. ROSENBERG. (U. Hawaii, Honolulu.)

INTERRELATIONSHIPS OF CERTAIN ECONOMIC CHARACTERS IN FOUR STRAINS OF NEW HAMPSHIRES. *Poultry Sci. 31:* 56-64. 1952.—Simple correlation coeffs. were calculated for 10 economic characters in 4 strains of New Hampshires that were developed in different geographical areas and raised and maintained at the U. of Hawaii poultry farm. Certain of the correlation values were in good agreement with those reported from widely separated experiment stations on the Mainland U.S.A. Among these were avg. size of the first 10 eggs and mean annual egg size, age at sexual maturity and mean wt. of the first 10 eggs, and 3 months' trapnest records and annual production. This similarity suggests the conclusion that these characters are less readily influenced by environment than by gene frequency. On the other hand, certain characters exhibited wide variations between the 4 strains in their degree of association. Correlation coeffs. varying from nonsignificant to highly significant were obtained for body wt. at 10 mos. of age and mean size of eggs produced between Nov. and April, age at sexual maturity and body wt. at 10 mo. of age, and age at sexual maturity and mean annual egg size. Despite these differences, significant values were derived when the data from the 4 strains were combined. Since there were marked differences between strains for these characters under the conditions of this single expt., there is little security in accepting any one correlation value from widely divergent expt. stations where environmental differences could augment genetic differences. New Hampshire pullets in Hawaii attained avg. egg size for the year during the 5th to 6th month of production, and they laid progressively larger eggs during each month of the 1st laying yr.—*M. M. Rosenberg.* (Biological Abstracts)

VONDELL, J. H. (U. Massachusetts, Amherst.)

THE LONGEVITY OF ESTROGEN PELLETS. *Poultry Sci. 31:* 174-175. 1952.—Examination of 14-weeks-old cockerels that had been implanted with one commercial estrogen pellet 6 wks. before killing revealed pellet residues 30-50% of the original pellet size. Removing the pellets and re-implanting them showed that the residue from 3 birds was about equal to a fresh pellet, as measured by comb height of the chickens. Heads and necks of birds implanted for 4-wks. were boiled 1-hr. The pellet residue was then removed and re-implanted in other chickens, and showed potency similar to the un-cooked pellets. In many cases the recovered pellets were imbedded in tissue, suggesting a walling-off process.—*J. H. Vondell.* (Biological Abstracts)

WEAKLEY, C. E., III, and C. S. Shaffner. (U. Maryland, College Park.)
THE FERTILIZING CAPACITY OF DILUTED CHICKEN SEMEN. *Poultry Sci. 30:* 932. 1951. *An abstract.* (Biological Abstracts)

WINCHESTER, C. F., and GEORGE K. DAVIS. (Florida Agric. Expt. Sta., Gainesville.)
INFLUENCE OF THYROXIN ON GROWTH OF CHICKENS. *Poultry Sci. 31:* 31-34. 1952.—New Hampshire chickens with thyroids destroyed by radioiodine attained nearly normal growth rates over a 150 day period when injected daily with from 1 to 12 μg. of synthetic DL-thyroxine. Birds receiving 2 and 4 μg. levels most nearly equaled performance of comparable controls.—*G. K. Davis.* (Biological Abstracts)

NUTRITION

ALMQUIST, H. J., and STANLEY MAURER. (Grange Co., Modesto, Calif.)
CHOLINE CONTENT OF CERTAIN FEEDSTUFFS. *Poultry Sci. 30:* 789-790. 1951.—The choline contents of several samples each of alfalfa, soybean, sesame, fish, and meat meals, barley, corn, milo and wheat are reported. Analysis of mixed feeds for choline compared closely with the calculated contents.—*Authors.* (Biological Abstracts)

ASMUNDSON, V. S., and F. H. KRATZER. (U. California, Davis.)
OBSERVATIONS ON VITAMIN A DEFICIENCY IN TURKEY BREEDING STOCK. *Poultry Sci. 31:* 71-73. 1952.—A low carotene and vit. A content of a ration fed to a breeding flock of turkeys resulted in vit. A deficiency symptoms and the death of a part of the flock. Fertility and hatchability of fertile eggs was greatly reduced and poult mortality increased. Many of the dead embryos showed gross skeletal and other abnormalities. Dosing the breeder turkeys with vit. A increased embryo and poult survival to about normal, but fertility remained low.—*V. S. Asmundson.* (Biological Abstracts)

ATKINSON, R. L., and J. R. COUCH. (Texas A. and M. Coll., College Station.)
THE EFFECT OF ADDED B-VITAMINS ON POULT GROWTH. *Poultry Sci. 30:* 934. 1951. *An abstract.* (Biological Abstracts)

ATKINSON, R. L., and J. R. COUCH. (Texas A. and M. College System, College Station.)
CRYSTALLINE ANTIBIOTICS IN THE NUTRITION OF POULTS KEPT ON RAISED SCREEN FLOORS. *Poultry Sci. 31:* 115-118. 1952.—Penicillin, aureomycin, and streptomycin increase the growth rate and improve the feed efficiency of turkey poults fed an all-vegetable protein diet and maintained in battery brooders with raised screen floors, which confirms an earlier report from this laboratory where the poults were kept in pens on litter. The injn. of vit. B_{12} tended further to increase the growth of turkey poults fed this ration supplemented with an antibiotic. Feed efficiency was improved by adding the antibiotics to the diet. Vit. B_{12} content of the tissues was not appreciably influenced by the various treatments, possibly because the dams of the poults used in this study were fed 0.25% aureomycin APF which may have influenced the carry-over of vit. B_{12} to poults. Vit. B_{12} injd. into birds fed the basal ration unsupplemented failed to increase the growth rate of turkey poults.—*Authors.* (Biological Abstracts)

ATKINSON, R. L., and J. R. COUCH. (Texas A. and M. Coll., College Station.)
THE EFFECT OF VITAMIN B_{12}, APF CONCENTRATE, AUREOMYCIN, STREPTOMYCIN, LIVER "L" AND FISH MEAL ON EGG PRODUCTION AND HATCHABILITY OF BROADBREASTED BRONZE TURKEYS. *Poultry Sci. 30:* 905-906. 1951. *An abstract.* (Biological Abstracts)

AYALA, ENRIQUE, and ELTON L. JOHNSON. (Iowa State Coll., Ames.)
VITAMIN B_{12} AND GROWTH INHIBITING PROPERTIES OF THE DRIED JUICE OF ALFALFA. *Poultry Sci. 30:* 893-899. 1951.—Dehydrated alfalfa meal and the dried juice of alfalfa were studied in expts. with chicks reared in battery brooders. Alfalfa contains vit. B_{12} activity and the concn. in the alfalfa juice was greater than in the meal. The growth inhibiting properties of alfalfa were also demonstrated. The inhibitor(s) occurred in larger amts. in the dried juice than in the dehydrated meal. Vit B_{12} was effective to a limited extent in overcoming the growth inhibition caused by alfalfa. The complex action of the inhibitor was demonstrated by the reduced inhibitory effect resulting from either the lowering of the soybean meal level in the simple vegetable ration or combining animal protein ingredients with corn and soybean meal.—*E. L. Johnson.* (Biological Abstracts)

BALLOUN, S. L., E. L. JOHNSON, and L. K. ARNOLD. (Iowa State Coll., Ames.)
LABORATORY ESTIMATION OF THE BIOLOGICAL VALUE OF SOYBEAN MEAL AS RELATED TO METHOD OF PREPARATION. *Poultry Sci. 30:* 906. 1951. *An abstract.* (Biological Abstracts)

BERG, LAWRENCE R., GORDON E. BEARSE, and V. L. MILLER. (Western Washington Expt. Sta., Puyallup.)
THE EFFECT OF PERIODICALLY INCREASING THE LEVEL OF CALCIUM AND/OR VITAMIN D ON THE PERFORMANCE OF LAYING PULLETS. *Poultry Sci. 30:* 799-804. 1951.—The performance of Leghorn pullets on a ration containing the nutrient allowances recommended by the National Research Council showed that periodically increasing the level of Ca and/or vit. D did not change egg production, egg weight, or prevent seasonal decline in shell thickness or smoothness. —*G. E. Bearse.* (Biological Abstracts)

BIELY, J., D. COOPER, and B. MARCH.
PELLETED FEED SCREENINGS AS SCRATCH FEED IN A POULTRY RATION. *Poultry Sci. 30:* 778-785. 1951.—A pelleted feed composed of 80% no. 1 feed screenings, 15% oat groats and 5% dehydrated cereal grass was evaluated as a substitute for wheat as the only scratch grain, and a 4-grain scratch mixture consisting of 60 parts of wheat, 20 parts of oats, 10 parts of barley, and 10 parts of corn, when fed to laying Leghorn pullets in conjunction with a 19.7% and a 17.3% protein mash. The comparison was based on egg production, maintenance of body weight, feed utilization, cost, and decrease in population. Pelleted screenings could replace wheat or a grain mixture as a scratch feed when fed at approx. equal amts. with laying mash containing 19.7% or 17.3% protein, respectively. The avg. percentage of egg production on a hen-day basis was practically the same in the groups receiving 19.7% protein as in the groups receiving 17.3% protein in the mash. The efficiency of feed utilization per dozen eggs, however, was greater with the 19.7% protein mash. As a consequence, when fed in approx. equal amts. with scratch grain, the 19.7% protein mash was more economical than the 17.3% protein laying mash.—*Auth. summ.* (Biological Abstracts)

BIELY, JACOB, and B. E. MARCH. (U. of British Columbia, Vancouver, Canada.)
A STUDY OF THE COMPARATIVE NUTRITIVE VALUE OF COMMERCIAL BROILER RATIONS. *Feedstuffs 24(6):* 30-39. 1952.—Two tests involving 6 commercial broiler rations fed to 2 breeds of chicks were reported. The control ration was a modification of the commercial broiler ration. Crude protein in the 1st series of test rations varied from 18.87% to 21.89 compared with 22.74% in the control. Crude fiber varied from 2.6 to 5.43%, resulting in variations in volume also. Ca varied from 0.83 to 1.37%, and P from 0.62 to .77%. The 2d series of rations was similar in analysis. The New Hampshire chicks in this test grew somewhat more slowly than the other breed involved, but there

was no direct comparison between the 2 lots, since one group was started 10 days later than the other with a different lot of feed. The rate of growth between rations was statistically significant. In test 1, 8 wk. weights varied from 909 to 1032 g. In test 2 the wts. at 9 wks. varied from 936 to 1145 g. The ration with the lowest percentage of protein and the highest fiber, Ca, and ash, produced the slowest growth and the poorest feed efficiency. The ration with the lowest fiber produced the heaviest chicks with relatively low feed consumption. Cockerels utilized feed more efficiently than pullets. Perosis developed in 4.47% of the chicks in test 1 and 1.22% of the chicks in test 2. 5.5% mortality was due to leucosis in test 2. There was a difference of 3.01¢ in feed cost/lb. gain in test 1, and 2.86¢ in test 2. The authors recommend greater selection of breeding stock and more rigid standardization of broiler rations. —*H. L. Wilcke.* (Biological Abstracts)

BIRD, H. R. (U. S. Dept. Agric., Beltsville, Md.)
IMPORTANCE IN POULTRY NUTRITION OF THE LATE ANIMAL PROTEIN FACTOR AND ITS OFFSPRING. *Poultry Sci. 30:* 907. 1951.—*An abstract.* (Biological Abstracts)

BOLIN, D. W., E. W. KLOSTERMAN, K. SCHLAMB, and R. L. BRYANT. (North Dakota Agric. Coll., Fargo.)
CHICK GROWTH RESPONSE TO DIFFERENT LEVELS OF METHIONINE AND PROTEIN SUPPLEMENTS ADDED TO A LOW METHIONINE DIET. *Poultry Sci. 30:* 907. 1951. *An abstract.* (Biological Abstracts)

BRANION, H. D., and D. C. HILL. (Ontario Agric. Coll., Guelph, Canada.)
THE COMPARATIVE EFFECT OF ANTIBIOTICS ON GROWTH OF POULTS. *Poultry Sci. 30:* 793-798. 1951.—Aureomycin HCl, penicillin G potassium, terramycin HCl and streptomycin SO_4 when added at a level of 25 mg./kg. of a diet containing 15% animal protein supplements or an all plant protein diet plus crystalline vit. B_{12} gave a growth response in poults to 8 wks. of age. Their relative ability to stimulate growth was not the same from 0 to 4 wks. as from 4 to 8 wks. Feed efficiency was improved only with the all plant protein diet. Chloromycetin at the same level did not improve growth or feed efficiency with either diet. The addition of crystalline vit. B_{12} to all plant protein diet improved growth and feed efficiency.—*D. C. Hill.* (Biological Abstracts)

BRUINS, H. W., M. L. SUNDE, W. W. CRAVENS. (U. Wisconsin, Madison), and **E. E. SNELL.** (U. Texas, Austin.)
GROWTH-PROMOTING ACTIVITY OF L-LYXOFLAVIN. *Proc. Soc. Exptl. Biol. and Med. 78:* 535-536. 1951.—The addition of 15 mg/kg. of L-lyxoflavin to a ration containing isolated soybean protein produced a 10% increase in the growth of chicks to 2 weeks of age. The mode of action is obscure. L-lyxoflavin has no riboflavin activity in the chick. Since the response was observed in the presence of 50 mg./kg. aureomycin, the effect is probably not due to antibiotic activity of the compound.—*H. W. Bruins.* (Biological Abstracts)

BRUINS, H. W., M. L. SUNDE, and W. W. CRAVENS. (U. Wisconsin, Madison.)
THE EFFECT OF CERTAIN MINOR MINERALS ON GROWTH OF CHICKS FED ALL VEGETABLE RATIONS. *Poultry Sci. 30:* 908. 1951.—Growth responses were obtained for As, F and Hg. (Biological Abstracts)

BUCKNER, G. D., W. W. INSKO, JR., E. F. WACHS, and A. H. HENRY. (Kentucky Agric. Expt. Sta., Lexington.)
THE INFLUENCE OF VITAMIN D ON THE GROWTH AND CALCIFICATION OF THE STERNI, TIBIAE, FEMORA, AND METATARSI OF NEW HAMPSHIRE COCKERELS. *Poultry Sci. 30:* 908. 1951. *An abstract.* (Biological Abstracts)

BURGESS, R. A., M. GLUCK, G. BRISSON, and D. H. LAUGHLAND. (Sci. Serv., Ottawa.)
EFFECT OF DIETARY PENICILLIN ON LIVER VITAMIN A AND SERUM CAROTENOIDS IN THE CHICK. *Arch. Biochem. and Biophys. 33:* 339. 1951.—Dietary penicillin (30 mg./kg.) increased serum carotenoid and liver vit. A of chicks fed a commercial type diet. These increases were not due to greater feed consumption or enhanced growth. (Biological Abstracts)

CARLSON, C. W., W. KOHLMEYER, D. G. JONES, and A. L. MOXON. (South Dakota State Coll., Brookings.)
AUREOMYCIN AND VITAMIN B_{12} SUPPLEMENTS IN A TURKEY BREEDER DIET. *Poultry Sci. 30:* 909. 1951. *An abstract.* (Biological Abstracts)

CARLSON, C. W., W. KOHLMEYER, D. G. JONES, and A. L. MOXON. (South Dakota State Coll., Brookings.)
LEVEL OF OATS IN TURKEY GROWING RATIONS. *Poultry Sci. 30:* 909. 1951. *An abstract.* (Biological Abstracts)

CARVER, J. S., J. McGINNIS. (State Coll. Washington, Pullman.), **B. R. BERG, and G. E. BEARSE.** (Western Washington Expt. Sta., Puyallup.)
THE EFFECTS OF ANTIBIOTIC SUPPLEMENTS ON EGG PRODUCTION. *Poultry Sci. 30:* 909-910. 1951. *An abstract.* (Biological Abstracts)

COATES, M. E., C. D. DICKINSON, G. F. HARRISON, and S. K. KON. (Natl. Inst. for Res. in Dairying, U. Reading, Eng.)
THE EFFECT OF ANTIBIOTICS ON THE GROWTH OF CHICKS DEPRIVED OF VITAMINS OF THE B COMPLEX. *Biochem. Jour. 49:* lxviii-lxix. 1951. *An abstract.* (Biological Abstracts)

COATES, M. E., J. E. FORD, G. F. HARRISON, S. K. KON, J. W. G. PORTER (Nat'l. Inst. Res. in Dairying, U. Reading, Eng.), **W. F. J. CUTHBERTSON,** and **H. F. PEGLER.** (Glaxo Labs. Ltd., Greenford, Middlesex, Eng.)
VITAMIN B_{12} ACTIVITY FOR CHICKS AND DIFFERENT MICROORGANISMS OF GUT CONTENTS AND FAECES [OF CALVES AND CHICKS]. *Biochem. Jour. 49:* lxvii-lxviii. 1951. *An abstract.* (Biological Abstracts)

COMBS, G. F., P. F. TWINING, C. S. SHAFFNER, and M. A. JULL. (U. Maryland, College Park.)
MARYLAND TESTS VALUE OF BROILER SUPPLEMENTS ON GROWTH, FEATHERING. *Feedstuffs 24(3):* 32-36. 1952.—Broilers brooded under 2 different systems (radiant heat and the Shenandoah system) showed marked differences in feathering. The type of brooding exerted much more effect upon feather score than any of the variables tried in the rations. Growth, feed efficiency and feather score were improved by adding 5 or 10 mg./lb. of niacin to diets made up with corn as the sole cereal. The optimum level of niacin in this type ration probably is in excess of 17.7 mg./lb. Similar results were obtained by adding pantothenic acid at a level of 4.5 mg./lb., although these results were apparent only in the radiant heat brooded broilers. The addition of oats and middlings tended to reduce feed efficiency somewhat with no improvement in rate of growth, but an improvement in feather score was noted in the radiant heated pens even when the ration contained 20 mg./lb. of niacin. Iodinated casein (protamone) improved feathering but reduced feed efficiency. The beneficial effect of iodinated casein on feathering is probably obtained only in warm weather.—*H. L. Wilcke.* (Biological Abstracts)

DAVIS, R. L., and G. M. BRIGGS. (U. Minnesota, St. Paul.)
STUDIES WITH ANTIBIOTICS IN CHICK AND POULT STARTING RATIONS. *Poultry Sci. 30:* 767-771. 1951.—Chick growth

stimulation resulted in most cases, but not in all, when a practical corn-soybean ration was supplemented with either aureomycin HCl, procaine penicillin G, bacitracin, or terramycin. Streptomycin, although stimulatory, was not as active as the other antibiotics. Poult growth was stimulated with aureomycin HCl and procaine penicillin G. The chick and poult showed improved feed efficiency when the diet was supplemented with an antibiotic. There was no indication that growth stimulation occurred as a simple manifestation of increased feed consumption. There was no apparent sparing action by an antibiotic on vit. B_{12} for either the chick or poult. Superior results were not obtained by 2 mixtures of different antibiotics.—*Auth. summ.* (Biological Abstracts)

DIECKERT, J. W., and J. R. COUCH. (Texas A. and M. Coll., College Station.)
THE LIVER "L" HATCHABILITY FACTOR IN THE NUTRITION OF THE MATURE FOWL. *Poultry Sci. 30:* 935. 1951. *An abstract.* (Biological Abstracts)

DIXON, J., and R. H. THAYER. (Oklahoma A. and M. Coll., Stillwater.)
OBSERVATIONS ON THE GROWTH PROMOTING ACTION OF ANTIBIOTICS IN THE CHICK. *Poultry Sci. 30:* 910. 1951. *An abstract.* (Biological Abstracts)

ELAM, J. F., L. L. GEE, and J. R. COUCH. (Texas A. and M. Coll., College Station.)
THE EFFECT OF FEEDING AND INJECTING PENICILLIN AND AUREOMYCIN ON THE GROWTH AND INTESTINAL MICROFLORA OF THE GROWING CHICK. *Poultry Sci. 30:* 935. 1951. *An abstract.* (Biological Abstracts)

ELAM, J. F., L. L. GEE, and J. R. COUCH. (Texas A. and M. Coll., College Station.)
FUNCTION AND METABOLIC SIGNIFICANCE OF PENICILLIN AND BACITRACIN IN THE CHICK. *Proc. Soc. Exptl. Biol. and Med. 78:* 832-836. 1951.—The feeding of penicillin, but not of autoclaved penicillin, stimulated the growth of birds fed an all-vegetable protein diet. The injn. of either penicillin or autoclaved penicillin similarly increased growth. Bacitracin when administered orally or parenterally increased the rate of growth. Under the conditions of the expt. reported herein, the feeding of penicillin increased the penicillin- and aureomycin-resistant organisms and increased the yeast count. The parenteral admn. of penicillin had no effect on the fecal microflora. Autoclaved penicillin had little effect upon the fecal microflora. Bacitracin when administered orally or parenterally failed to have any effect upon the fecal microflora. Since the parenteral admn. of antibiotics and autoclaved penicillin increased the rate of growth and yet had little effect on the fecal aerobic microflora count, it seems possible that the antibiotics may have stimulated growth by some other mechanism. Thus, it might be surmised that the antibiotic molecule or a fragment of same might act as a metabolite within the body of the bird.—*J. R. Couch.* (Biological Abstracts)

FULLER, H. L., C. W. CARRICK, and S. M. HAUGE. (Purdue U., Lafayette, Ind.)
A COMPARISON OF VITAMIN B_{12} FISH SOLUBLES AND WHEY IN THE GROWTH OF CHICKS. *Poultry Sci. 30:* 912-913. 1951. *An abstract.* (Biological Abstracts)

GARTLEY, K. M., S. J. SLINGER, A. M. MORPHET, and C. R. CAMERON. (Ontario Agric. Coll., Guelph, Canada.)
THE CHOLINE REQUIREMENTS OF BROADBREASTED BRONZE TURKEYS IN THE PRESENCE OF APF CONCENTRATES. *Poultry Sci. 30:* 913. 1951. *An abstract.* (Biological Abstracts)

GERMAN, H. L., and J. R. COUCH. (Texas A. and M. Coll., College Station.)
EFFECT OF METHODS OF PROCESSING ON THE NUTRITIVE VALUE OF COTTONSEED MEAL FOR CHICKS. *Poultry Sci. 30:* 913. 1951. *An abstract.* (Biological Abstracts)

GERRY, R. W., J. R. SMYTH, and C. E. HOWES. (Maine Agric. Expt. Sta., Orono.)
POTATO PRODUCTS FOR POULTRY. 1. THE VALUE OF A POTATO STARCH WASTE PRODUCT IN RATIONS FOR GROWING CHICKENS. *Poultry Sci. 30:* 913-914. 1951. *An abstract.* (Biological Abstracts)

GILLIS, M. B., L. C. NORRIS, and G. F. HEUSER. (Cornell U., Ithaca, N. Y.)
BIOLOGICAL AVAILABILITY OF INORGANIC PHOSPHATES [FOR CHICKS]. *Poultry Sci. 30:* 914. 1951. *An abstract.* (Biological Abstracts)

HALBROOK, E. R., and A. F. BEECKLER. (Montana State Coll., Bozeman.)
THE VALUE OF VITAMIN B_{12}-ANTIBIOTIC SUPPLEMENT WHEN ADDED TO POULTRY MASH MIXTURES CONTAINING AN ANIMAL PROTEIN CONCENTRATE. *Poultry Sci. 30:* 916. 1951. *An abstract.* (Biological Abstracts)

HEUSER, G. F. (Cornell U., Ithaca, N. Y.)
SALT ADDITIONS TO CHICK RATIONS. *Poultry Sci. 31:* 85-88. 1952.—Addition of 0.25-4% of salt to a practical ration improved the growth of Single Comb White Leghorn chicks to 8 wks of age. The total min. salt requirement in this expt. was approx. 0.65%. Increased amts. of salt increased water intake and raised the moisture content of the droppings. Mortality was not influenced at any level. Considering all factors for the representative chick ration used in this expt. addition of 0.25% of salt was sufficient.—*G. F. Heuser.* (Biological Abstracts)

HEUSER, G. F., M. L. SCOTT (Cornell U., Ithaca, N. Y.), **RODERICK K. ESKEW, and PAUL W. EDWARDS.** (Eastern Regional Res. Lab., Philadelphia.)
STUDIES IN DUCK NUTRITION. III. THE FEEDING OF POTATOES TO DUCKS. *Poultry Sci. 30:* 672-678. 1951.—20% potato meal could be substituted for corn or standard middlings in rations for Pekin ducks without affecting live or dressed weights at 9 weeks of age. When 30% was used, weights were slightly, but not significantly reduced. Avg. live wt. of all ducks used in the expt. was 6.62 lbs. at 9 wks. of age. Avg. feed consumed per duck at 9 wks. was 23.06 pounds.—*P. W. Roderick.* (Biological Abstracts)

HILL, D. C., and H. D. BRANION. (Ontario Agric. Coll., Guelph, Canada.)
INFLUENCE OF DIET COMPOSITION ON THE RESPONSE OF CHICKS TO VITAMIN B_{12}. *Poultry Sci. 30:* 917. 1951. *An abstract.* (Biological Abstracts)

INGRAM, G. R., and S. A. EDGAR. (Alabama Agric. Expt. Sta., Auburn.)
THE EFFECT OF CERTAIN ANTIBIOTICS AND OTHER DRUGS ON THE GROWTH OF CHICKS INFECTED WITH EIMERIA TENELLA. *Poultry Sci. 30:* 918. 1951.—Data indicate that antibiotics do not act on growth through inhibition of cecal coccidiosis. (Biological Abstracts)

JOHNSON, E. L. (Iowa State Coll., Ames.)
VITAMIN B_{12} REQUIREMENTS OF HENS AS AFFECTED BY CHOLINE AND ANTIBIOTIC ADDITIONS TO THE DIET. *Poultry Sci. 30:* 919. 1951. *An abstract.* (Biological Abstracts)

JOHNSON, E. L. (Iowa State Coll., Ames.)
VITAMIN B_{12} AND CHOLINE IN TURKEY NUTRITION. *Poultry Sci. 30:* 919-920. 1951. *An abstract.* (Biological Abstracts)

JONES, H. L., and G. F. COMBS. (U. Maryland, Collge Park.)
EFFECT OF ANTIBIOTICS ON DIETARY REQUIREMENT FOR METHIONINE, LYSINE, TRYPTOPHAN, AND UNIDENTIFIED GROWTH FACTORS [FOR CHICKS]. *Poultry Sci. 30:* 920. 1951. *An abstract.* (Biological Abstracts)

KENNARD, D. C., and V. D. CHAMBERLIN. (Ohio Agric. Expt. Sta., Wooster.)
ALL-PLANT DIETS FOR GROWTH OF CHICKENS AND EGG PRODUCTION. *Poultry Sci. 30:* 920. 1951. *An abstract.* (Biological Abstracts)

KODRAS, R., W. T. COONEY, and J. S. BUTTS. (Oregon State Coll., Corvallis.)
EFFECT OF ALFALFA MEAL, ALFALFA LEAVES, ALFALFA STEMS, AND FRESH ALFALFA ON CHICK GROWTH. *Poultry Sci. 30:* 786-787. 1951.—Results indicate that (1) the factor(s) in alfalfa responsible for depressing chick growth is (are) present in fresh plant material as well as processed material and concentrated to a greater extent in the leaves than the stems, and (2) fiber is secondary in importance. (Biological Abstracts)

KRAMKE, E. H., and J. C. FRITZ. (The Borden Co., Elgin, Ill.)
THE [GROWTH] RESPONSE OF CHICKS AND POULTS TO LOW LEVELS OF ANTIBIOTICS. *Poultry Sci. 30:* 921. 1951. *An abstract.* (Biological Abstracts)

LILLIE, R. J., S. K. HAYNES, and H. R. BIRD. (U. S. Dept. Agric., Beltsville, Md.)
EFFECT OF FIBER IN NON-PELLETED AND PELLETED MASH UPON EGG PRODUCTION AND FEED EFFICIENCY. *Poultry Sci. 30:* 922. 1951. *An abstract.* (Biological Abstracts)

MacGREGOR, H. I., R. M. BLAKELY, and R. W. ANDERSON. (Dominion Expt. Sta., Swift Current, Sask., Canada.)
THE EFFECT ON POULT GROWTH OF THE REMOVAL AT TEN DAYS OF FISH MEAL AND MILK POWDER FROM A STARTER MASH CONTAINING FIVE PERCENT OF MEAT MEAL. *Poultry Sci. 30:* 923. 1951. *An abstract.* (Biological Abstracts)

McGINNIS, J. (State Coll., Washington, Pullman.)
THE EFFECT OF ANTIBIOTICS ON NUTRITIONAL REQUIREMENT OF TURKEYS AND CHICKS. *Poultry Sci. 30:* 924. 1951. *An abstract.* (Biological Abstracts)

MADSEN, I. L., L. W. CHARKEY, W. K. MANNING, and H. S. WILGUS. (Colorado A. and M. Coll., Ft. Collins.)
THE NUTRITIONAL VALUES OF BEET SUGAR MOLASSES BY-PRODUCTS [FOR CHICKS]. *Poultry Sci. 30:* 935. 1951. *An abstract.* (Biological Abstracts)

MILLIGAN, J. L., and H. R. BIRD. (U. S. Dept. Agric., Beltsville, Md.)
SUITABILITY FOR CHICKENS OF A RIBOFLAVIN CONCENTRATE OBTAINED FROM ASHBYA GOSSYPII. *Poultry Sci. 30:* 735-737. 1951.—The riboflavin concentrate obtained from *Ashbya gossypii* proved to be a satisfactory supplement to the diet of growing chickens. Its riboflavin content was fully available for chick growth and the prevention of curled-toe paralysis.—*Auth. summ.* (Biological Abstracts)

MILLIGAN, J. L., and H. R. BIRD. (U. S. Dept. Agric. Beltsville, Md.)
EFFECT OF PROCESSING VARIANTS ON THE NUTRITIVE VALUE OF COTTONSEED MEAL FOR CHICKS. *Poultry Sci. 30:*

651-657. 1951.—Variations in either cooking or pressing of cottonseed meal may have profound effects on the nutritional value of the meal for growing chicks. Apparently the max. temp. reached during cooking exerts the most important effect among the variables tried in these expts. This temp. should not exceed 200°F., and there are indications that 160°F. may be a more satisfactory max. Both the supply of available lysine as measured by white feather score and the percentage of soluble N tended to decrease with increasing temp. of cooking. Within the range tried duration of cooking had no measurable effect on the feeding value when the max. temp. was 200°F. Cottonseed meals containing 0.01 to 0.108% of free gossypol-like material were fed safely as 39% of the total diet of young chicks and as the only protein supplement. When the meals were fed as 70% of the total diet, 0.02% of gossypol-like material was not harmful but a level of 0.108% was. Chicks attained greater final wt. on 70% cottonseed meal than on 39%, provided the meal was low in free gossypol. Meals pressed with an energy input of 50 amperes to the test press contained more soluble N and in general were better nutritionally than meals pressed with an input of 60 amperes. Addition of water to the cooker, under the exptl. conditions, had no beneficial effect on the feeding value of the meal. These expts. give reason to believe that it is possible to process cottonseed meal in such a way that it is equal to soybean meal in feeding value for growing chickens. —*Authors.* (Biological Abstracts)

MISHLER, D. H., C. W. CARRICK, and S. M. HAUGE. (Purdue U. Lafayette, Ind.)
VITAMIN SUPPLEMENTATION OF CHICK RATIONS AS AFFECTED BY GRAIN PRODUCTS. *Poultry Sci. 30:* 886-892. 1951.—In the presence of condensed fish solubles of 0.2% of choline chloride or 0.3% of DL-methionine significantly increased growth in a simplified corn and soybean oil meal ration, but were without additional supplementary value in a more complex mixed grain ration. Efficiency of feed utilization was also much greater with the simplified ration as contrasted to the mixed grain ration. When ground barley, ground oats, wheat middlings and wheat bran were fed at 30% levels, each significantly retarded growth as compared with an otherwise similar ration in which corn replaced these feeds. When attempts were made to improve the mixed grain ration by omitting one feed at a time and replacing it with corn, there was an increase in growth response as well as an increase in feed efficiency in every instance. Both mixed grain and simplified corn and soybean oil meal rations were improved with high significance by the addition of condensed fish solubles. *Authors.* (Biological Abstracts)

PEPPER, W. F., S. J. SLINGER, and I. MOTZOK. (Ontario, Agric. Coll., Guelph, Canada.)
THE EFFECT OF AUREOMYCIN ON THE INTERRELATIONSHIP BETWEEN MANGANESE AND SALT IN CHICKS. *Poultry Sci. 30:* 926-927. 1951. *An abstract.* (Biological Abstracts)

PETERSEN, C. F., C. E. LAMPMAN, and A. C. WEISE. (U. Idaho, Moscow.)
USE OF AN APF SUPPLEMENT WITH AND WITHOUT FISH MEAL FOR EGG PRODUCTION AND HATCHABILITY. *Poultry Sci. 31:* 132-136. 1952.—An APF supplement prepared from the production of aureomycin was added to an all-plant ration of White Leghorn laying hens. Two groups also received an addition either 1 or 5% herring fish meal. Each ration was fed to 1 lot of hens reared on wire floors and to 1 lot on build-up litter. Exptl. rations were fed for 9 mos. and data obtained for egg production, egg size, body wt., hatchability, and subsequent chick quality. The all-plant basal ration did not permit max. egg production or egg size, and hatchability was low with hens on wire. The basal ration fed to hens on litter supported good production and hatchability of eggs. The APF at 0.25% failed to support max. hatchability when fed to hens on wire. Max. hatchability was obtained with 5% fish meal on wire and with 0.25% APF alone or with 1 and 5% fish meal fed

to hens on litter. The APF did not supply sufficient B_{12} to permit max. transfer of this vit to chicks produced. The product and 1% fish meal was also inadequate. Fish meal at 5% permitted max. transfer for high-quality day-old chicks.—*C. F. Petersen.* (Biological Abstracts)

REID, B. L., J. H. QUISENBERRY, and J. R. COUCH. (Texas A. and M. Coll., College Station.)
AUREOMYCIN, VITAMIN B_{12}, METHIONINE AND LEVEL OF PROTEIN IN MATURE FOWL NUTRITION. *Poultry Sci. 30:* 935. 1951. *An abstract.* (Biological Abstracts)

REYNOLDS, J. W., T. D. RUNNELS, and E. F. WALLER. (U. Delaware, Newark.)
A COMPARISON OF TERRAMYCIN AND PENICILLIN AT VARIOUS LEVELS ON RATE OF GROWTH AND FEED EFFICIENCY IN BROILER DIETS. *Poultry Sci. 30:* 928. 1951. *An abstract.* (Biological Abstracts)

RUNNELS, T. D., J. W. REYNOLDS, and E. F. WALLER. (U. Delaware, Newark.)
THE INFLUENCE OF VARIOUS LEVELS OF PENICILLIN AND STREPTOMYCIN ON RATE OF GROWTH AND FEED EFFICIENCY IN BROILER DIETS. *Poultry Sci. 30:* 929-930. 1951. *An abstract.* (Biological Abstracts)

RUNNELS, T. D., E. F. WALLER (U. Delaware, Newark), **E. G .KELLEY, and S. KRULICK.** (U. S. Dept. Agric., Philadelphia, Pa.)
GROWTH PROMOTION AND PIGMENTATION PROPERTIES OF DEHYDRATED BROCCOLI LEAF MEAL IN A PRACTICAL BROILER DIET. *Poultry Sci. 30:* 930. *An abstract.* (Biological Abstracts)

SCOTT, H. M., W. A. GLISTA, and E. A. GOFFI. (Illinois Agric. Expt. Sta., Urbana.)
GROWTH EFFECTS OF CERTAIN SUPPLEMENTS ADDED TO A CORN-SOYBEAN OIL MEAL CHICK RATION WITH AND WITHOUT ANTIBIOTIC. *Poultry Sci. 30:* 930. 1951. *An abstract.* (Biological Abstracts)

SCOTT, M. L. (Cornell U., Ithaca, N. Y.)
STUDIES ON THE ENLARGED HOCK DISORDER IN TURKEYS. 2. FACTORS AFFECTING THE EXCRETION AND RETENTION OF CREATINE BY YOUNG POULTS. *Poultry Sci. 30:* 839-845. Illus. 1951.—Expts. are described showing a correlation between the incidence of the enlarged hock disorder and creatinuria in young poults. The creatinuria and the enlarged hock disorder were prevented by admn. of inositol and/or p-aminobenzoic acid but not by vit. E. or certain derivatives of vit. E. The effects of inositol and p-aminobenzoic acid appear to be indirect, through stimulation of certain intestinal microorganisms to synthesize an unknown required factor or factors. Addition of a methylating agent, betaine, to the diet caused an increase in creatine content of the leg muscles of poults receiving either the basal diet or this diet supplemented with glycine.—*M. L. Scott.* (Biological Abstracts)

SCOTT, M. L. (Cornell U., Ithaca, N. Y.)
STUDIES ON THE ENLARGED HOCK DISORDER IN TURKEYS. 3. EVIDENCE OF THE DETRIMENTAL EFFECT OF FISH LIVER OIL AND THE BENEFICIAL EFFECT OF DRIED BREWERS' YEAST AND OTHER MATERIALS. *Poultry Sci. 30:* 846-855. 1951.—Results are presented which show that the addition of fish liver oil to the diet of poults produced a marked increase in incidence of the enlarged hock disorder. This discovery, together with the earlier findings that poults suffering from enlarged hocks show a severe creatinuria, strongly indicates that the enlarged hock disorder is the counterpart in turkeys of encephalomalacia and exudative diathesis in chicks and of muscular dystrophy in rabbits and guinea pigs. Indeed, the disorder in

turkeys appears to be a form of nutritional muscular dystrophy. Vit. E, which has usually been found to be the primary deficiency in cases of encephalomalacia in chicks and muscular dystrophy in mammals, had little or no effect upon the enlarged hock disorder in turkeys under the exptl. conditions used. On the other hand, dried brewers' yeast, a source of a water-soluble factor which has been postulated to be required in addition to vit. E for prevention of muscular dystrophy in rabbits was found to be very effective in preventing the enlarged hock disorder even in the presence of fish liver oil. Supplementary betaine, in addition to the choline present in the basal diet at the level recommended by the National Research Council, increased the levels of muscle creatine. On the other hand, addition of fish liver oil caused a marked decrease in creatine content of the leg muscles of poults under these conditions. In general, the presence of an antibiotic in the diet had a beneficial effect upon the enlarged hock disorder. The possible role of the intestinal microorganisms of the poult in the prevention of enlarged hocks are discussed.—*M. L. Scott.* (Biological Abstracts)

SERFONTEIN, P. J. (South Africa Poultry Assn.)
THE VALUE OF PELLETS IN THE FEEDING OF DUCKS. *(South Africa Poultry Assn.) Poultry Bulletin, South Africa 15,* 168, 9-11, 1951.—For this investigation 4 groups of Pekin ducks were divided into duplicate groups of drakes and ducks. The one group received whole dry pellets and the second group was fed grinded pellets in a wet form from 1 day to 12 weeks of age. There was no significant difference in the average live weights at 12 weeks of age. It is concluded that whole dry pellets is more economical than wet mash as less feed is wasted. Pellet feeding also saves labour, hopper space and it is more hygienic.

The percentage split wings varied from 16.7 to 33.3 per cent in the different groups. This wing abnormality is probably associated with a deficiency of manganese or choline or biotin.—*A. M. Gericke.*

SLINGER, S. J., J. E. BERGEY, W. F. PEPPER, and D. ARTHUR. (Ontario Agric. Coll., Guelph, Canada.)
THE EFFECT OF ANTIBIOTICS ON THE PROTEIN REQUIREMENT OF BROILERS. *Poultry Sci. 30:* 936. 1951. *An abstract.* (Biological Abstracts)

STEPHENSON, EDWARD L., and R. M. SMITH. (U. Arkansas, Fayetteville.)
THE STORAGE QUALITY OF EGGS PRODUCED BY HENS FED SCREW-PROCESSED COTTONSEED MEAL. *Poultry Sci. 31:* 98-100. 1952.—Eggs were obtained from hens fed diets containing a commercially available solvent processed cottonseed meal, a solvent processed soybean oil meal, and an exptl. screw-processed cottonseed meal were stored at 38°F. for 6 months. Feeding of screw-pressed cottonseed meal did not adversely affect egg storage quality as did the solvent-processed cottonseed meal. The storage quality of the eggs produced from hens fed screw-pressed cottonseed meal were similar to those produced by the hens receiving soybean oil meal.—*E. L. Stephenson.* (Biological Abstracts)

STERN, JOEL R., JENG MEIN HSU, and JAMES McGINNIS. (State Coll. Washington, Pullman.)
VITAMIN B_{12} AND HEMOGLOBIN REGENERATION IN THE CHICK. *Jour. Biol. Chem. 194:* 191-197. 1952.—Unlike the rat, mouse, pig, fox, and mink the chick maintained normal hematocrit and hemoglobin levels in an uncomplicated vit. B_{12} deficiency, but the growth rate was severely retarded. When the vit. B_{12} deficiency was aggravated by anemia produced by injns. of phenylhydrazine HCl, vit. B_{12} had a stimulatory action on hemoglobin and hematocrit. In the presence of phenylhydrazine chicks fed vit. B_{12} had significantly higher hemoglobin, hematocrit, and erythrocyte concns. than chicks deficient in vit. B_{12}. A single injn. of phenylhydrazine into 3-week-old chicks caused anemia and a 7-day period elapsed before the hemoglobin level of deficient chicks reached a normal level, whereas only 5 days were required for

hemoglobin of vit. B_{12}-supplemented chicks to return to normal.—*J. R. Stern.* (Biological Abstracts)

STERN, JOEL R., JOHN McN. SIEBURTH, and JAMES McGINNIS. (The State Coll. Washington, Pullman.)
LACK OF GROWTH RESPONSE OF TURKEY POULTS TO CERTAIN ANTIBIOTICS AND BACTERIOSTATIC AGENTS. *Poultry Sci. 31:* 179-180. 1952.—Expts were conducted with turkey poults to observe the effect on early growth of feeding certain antibiotics and bacteriostatic agents. None of substances tested stimulated growth as much as procaine penicillin. It was considered possible, therefore, that the effect of penicillin on the intestinal microflora is not equalled by those substances which failed to stimulate growth.—*Joel R. Stern.* (Biological Abstracts)

STEWART, I. J.
FEEDING METHIONINE TO COCKERELS. *Jour. Dept. Agric. Victoria 49:* 415. 1951.—Feeding of 0.25% of methionine in the normal ration of 4 month-old Australorp cockerels resulted in no increase in weight of treated birds over the controls. It is probable that no response was obtained as there was already sufficient in the diet from the meatmeal.—*R. E. Bugbee.* (Biological Abstracts)

SUNDE, M. L., W. W. CRAVENS, and J. G. HALPIN. (U. Wisconsin, Madison.)
THE EFFECT OF VITAMIN B_{12}, ANTIBIOTICS AND DEEP LITTER ON LAYING AND BREEDING HENS. *Poultry Sci. 30:* 932. 1951. *An abstract.* (Biological Abstracts)

TODD, A. C. (Kentucky Agric. Expt. Sta., Lexington.)
SUPPLEMENTAL METHIONINE IN THE DIET AND GROWTH OF PARASITIZED CHICKS. *Poultry Sci. 30:* 820-824. 1951.—Methionine-supplemented rations fed chicks parasitized by *Ascaridia galli* did not enable them to withstand better effects of infection and achieve superior weight gains than did the basal ration only. Growth rates of chicks fed 1.8% methionine were inferior to those fed 0.9% methionine, or the basal ration only.—*A. C. Todd.* (Biological Abstracts)

WEST, J. W., C. W. CARRICK, S. M. HAUGE, and E. T. MERTZ. (Purdue U., Lafayette, Ind.)
THE RELATIONSHIP OF CHOLINE AND CYSTINE TO THE METHIONINE REQUIREMENT OF YOUNG CHICKENS. *Poultry Sci. 30:* 880-885. 1951.—A basal purified diet, which would afford rapid growth with methionine supplementation, consisted of 12% casein, 10% gelatin, 2% blood fibrin, cerelose, ruffex, mineral salts, synthetic vitamins and A.P.F. supplement. Microbiological assays of the protein indicated 0.4% methionine and 0.1% cystine in the diet. Both D- and L-methionine are equally utilizable. Two levels (0.1 and 0.2%) of choline were tested with combination of methionine and cystine at levels of 0.5, 0.7, 0.9, 1.1, 1.3, and 1.5%, with cystine maintained at 0.1%. Statistical analysis of 2- to 6-week paired gains indicated growth maxima at 0.9%, for both the high and low levels of choline. Repetition of this expt. using 0.1% choline and sulfur amino acids at levels of 0.5, 0.6, 0.7, 0.8, 0.9, and 1.1% resulted in optimum growth at 0.7%. Results are presented of attempts to resolve the total S amino acid requirement into methionine and cystine components.—*Authors.* (Biological Abstracts)

WINTER, A. R. (Ohio State U., Columbus.)
FEEDING THE LAYING AND BREEDING FLOCK FOR MAXIMUM RESULTS. *Feedstuffs 24(4):* 28-35. 1952.—The trend is to feed mash concentrates and grains free choice in the Middle West. More cannibalism and feather picking has been reported on high energy-low fiber rations, even when the birds were on built-up litter. Egg production was lower when corn was replaced with corn and cob meal. There is a tendency to feed higher protein rations to laying flocks—17% is recom-

mended for all-pullet flocks. The amino acid requirement for egg production appears to be about the same as for growth. Feeding granite grit resulted in 5% higher egg production. Vit B_{12} is essential for growth, egg production, and hatchability. The earlier work showed a possible need for antibiotics in the laying and breeder ration, but more recent work has not confirmed this interpretation. Data on the effects of hormones on egg production are conflicting.—*H. L. Wilcke.* (Biological Abstracts)

P ATHOLOGY

BRESSLER, G. O., S. GORDEUK, JR., E. W. CALLENBACH, and G. H. PRITHAM. (Pennsylvania State Coll., State College.)
THE EFFECT OF SALT AND CARBOLINEUM IN PRODUCING ASCITES IN TURKEY POULTS. *Poultry Sci. 30:* 738-744. 1951.— A total of 840 poults were used in 2 expts. Exptl. evidence indicated that carbolineum disinfection of pens played a minor role if any, in causing the so-called water-belly condition in poults. Added salt at the 0.9% levels and above resulted in considerable mortality from ascites and visceral edema.—*Authors.* (Biological Abstracts)

BRUNSON, CLAYTON C., and GEORGE F. GODFREY. (Oklahoma Agric. Expt. Sta., Stillwater.)
A FOURTEEN-YEAR SUMMARY OF MORTALITY IN THE OKLAHOMA EGG LAYING TEST. *Poultry Sci. 31:* 149-154. 1952.—Autopsy records of the Oklahoma Egg Laying Test were summarized for the period of 1936-1950 to determine the trend and main causes of mortality. Annual mortality rates ranged from 13.84% to 26.3% with an avg. of 20.27%. There was a tendency for the annual rate to decrease during the last 4 yrs., 1947-1950. The highest mortality rates for the period were shown by White Plymouth Rocks and White Leghorns; the lowest rates were for New Hampshires and R. I. Reds. There was no difference in mortality between light and heavy breeds. Major causes of mortality were reproductive disorders, lymphomatosis and respiratory disorders, with the total mortality due to each being 22.1, 13.3, and 11%, respectively. Reproductive disorders tended to be highest about 2 mos. after the peak of production was reached. The incidence of lymphomatosis tended to be highest during Jan. through March. The visceral manifestation was responsible for about 80% of all losses due to this disorder. Respiratory disorders were greatest during the winter and summer mos., probably because of temp. extremes.—*C. C. Brunson.* (Biological Abstracts)

EDEN, W. G. (Alabama Polytech. Inst., Auburn.)
TOXICITY OF DIELDRIN TO CHICKENS. *Jour. Econ. Ent. 44:* 1013. 1951.—The LD_{50} of dieldrin by acute oral doses for 3- and 6-week old New Hampshire Red chickens was found to be 20-30 mg./kg. of body weight. Chickens receiving 50 and 100 ppm. of dieldrin in the diet died before end of a 90-day feeding test; those receiving 25 ppm. survived but died within 6 months. Symptoms of poisoning by dieldrin are given. (Biological Abstracts)

POULTRY PRODUCTION AND MARKETING

ALFORD, LUCEY R., N. E. HOLMES, W. J. SCOTT, and J. R. VICKERY.
STUDIES IN THE PRESERVATION OF SHELL EGGS. I. THE NATURE OF WASTAGE IN AUSTRALIAN EXPORT EGGS. *Australian Jour. Applied Sci. 1:* 208-214. 1950.—The wastage which occurred in Australian shell eggs exported to the United Kingdom was found to be due mainly to bacterial rots, almost all of which developed after dis-

charge from the refrigerated space on shipboard. The out-turn of exptl. shipments forwarded from several States followed closely the out-turn of control lots stored in Australia. Eggs from certain farms were found consistently to develop appreciable wastage, whereas those from some other farms were consistently free from rotting. The importance of preshipment factors in determining liability to wastage is, therefore demonstrated. The various types of bacterial rots are described and the relative frequency of their occurrence is listed. The 3 principal types were found to include over 95% of the observed rots.*Auth. abst.* (Biological Abstracts)

BAUM, E. L., W. J. STADELMAN, H. G. WALKUP, and O. L. BROUGH. (State Coll. Washington, Pullman.)
ECONOMIC IMPLICATIONS OF GROWTH, PROCESSING SHRINKAGE, AND QUALITY OF DIETHYLSTILBESTROL TREATED FRYERS. *Poultry Sci. 30:* 701-706. 1951.—Under present economic conditions, the wide adoption of diethylstilbestrol-treated fryers will have beneficial economic effects on the producer, handler and consumer—provided the industry vertically integrates sufficiently the processes necessarily involved in securing greater efficiency in production, processing, distribution, and also the attainment of a wider consumer acceptance of such fryer meat. The producer benefits by greater monetary gains resulting from general upgrading of fryers, possible premiums for superior quality meat, and higher dressed weight. The handler benefits from greater quality standardization of product and probable expanded sales. The consumer benefits by consuming this type of bird because the meat is more tender and he is assured of a more standardized product with desired quality.—*Auth. summ.* (Biological Abstracts)

DAWSON, L. E., and J. A. DAVIDSON. (Michigan State Coll., E. Lansing.)
THE EFFECT OF FARM PRACTICES ON THE MARKET GRADE OF EGGS. *Poultry Sci. 30:* 910. 1951. *An abstract.* (Biological Abstracts)

ESSARY, E. O. (U. Tennessee, Knoxville.)
NEW METHODS OF UTILIZING POULTRY THROUGH POULTRY SPECIALTIES. *Poultry Sci. 30:* 912. 1951. *An abstract.* (Biological Abstracts)

FEENEY, R. E., R. B. SILVA, and L. R. MacDONNELL. (Western Region. Res. Lab., Albany, California.)
CHEMISTRY OF SHELL EGG DETERIORATION: THE DETERIORATIONS OF SEPARATED COMPONENTS. *Poultry Sci. 30:* 645-650. Illus. 1951.—Sterile, whole broken-out eggs, separated whites and separated yolks were prepared from eggs sterilized by submersion in alcohol and dipping in phenol. The deteriorations of these components during storage were studied. It was found that whole, broken-out eggs exhibited the deteriorative weakening of the yolk and thinning of the white which occur in intact eggs in the shell and that sterile, separated whites thinned on storage. Unsatisfactory and inconclusive results were obtained in the studies with separated yolks. It was concluded that the shells or shell membranes are not significant sources of the agents or mechanisms causing the deteriorations and that a major cause of thinning of the white is inherent in the white itself.—*R. E. Feeney.* (Biological Abstracts)

FORSYTHE, R. H. (Iowa State Coll., Ames.)
THE EFFECT OF CLEANING ON THE QUALITY OF SHELL EGGS. *Poultry Sci. 30:* 912. 1951. *An abstract.* (Biological Abstracts)

FORSYTHE, RICHARD H. (Iowa State Coll., Ames.)
THE EFFECT OF CLEANING ON THE FLAVOR AND INTERIOR QUALITY OF SHELL EGGS. *Food Technol. 6*(2): 55-58. 1952.—Shell eggs washed in aqueous solns. at 110°F. suffered no greater losses in interior quality than unwashed eggs when held under conditions approx.

commercial cold storage. Subjective evaluation of the flavor and odor of these eggs with a trained taste panel indicated that the flavors and/or odors were absorbed from the washing solns. under all conditions studied, but were less noticeable after the eggs were held in cold storage for approx. 2 mos. (Biological Abstracts)

GAINER, JEAN M. (U. Alberta, Edmonton, Canada.), **GEORGE F. STEWART.** (U. California, Davis), **and BELLE LOWE.** (Iowa State Coll., Ames.)
EFFECT OF HAND AND MACHINE MASSAGE ON THE TENDERNESS OF POULTRY MUSCLES AGED FOR SHORT-TIME PERIODS. *Food Res. 16:* 469-473. 1951.—Roasters were held short periods, 30 and 60 mins., after slaughter before cooking was started. The 80 birds of the 30-min. aged lot were divided into 7 groups; a control and the massaged groups. Massage was done by hand (4 or 8 min.) and by varying the picking time on the 2 defeathering machines (15 to 60 sec.). The 19 birds of the 60-min. aged lot were divided into a control and a 4-min. hand massaged group. The large breast muscle and the thigh muscles of the machine and hand massaged groups of roasters of the 30-min. aged lot were scored more tender than those of the control birds (hand picked). The shear force values and the tenderness scores, however, did not show close agreement. The muscles of the 19 birds that struggled during scalding and picking (this could not be controlled) were scored more tender than muscles from birds of the same lot that did not struggle. The muscles of roasters aged 60 min. after killing before cooking was started scored more tender than those from birds held 30 min. —*Belle Lowe.* (Biological Abstracts)

GERICKE, A. M. M. (Pretoria University, Pretoria, S. Africa.)
THE PRODUCTION AND MARKETING OF EGGS. *Department of Agriculture, Union of South Africa Bulletin No. 307,* 1-36. 1951.—This Bulletin deals with the structure of the egg and the various factors influencing its quality. The grades of eggs are given, packing, storage, preservation and seasonal distribution.—*A. M. M. Gericke.*

GILLESPIE, J. M., and W. J. SCOTT.
STUDIES IN THE PRESERVATION OF SHELL EGGS. IV. EXPERIMENTS IN THE MODE OF INFECTION BY BACTERIA. *Australian Jour. Applied Sci. 1:* 514-530. 1950.—Cleaning methods which themselves caused no bacterial rotting did not cancel the deleterious effects of machine cleaning. Immersion of machine-washed eggs in strong disinfectant solns. was likewise unable to reduce bacterial rotting, even though the disinfectant destroyed most of the bacteria on the shells. The organisms causing rots were, therefore, presumed to have passed immdiately into or through the shell. Certain other factors, including shell thickness, were shown to affect the amt. of rotting presumably by influencing bacterial penetration of the shell. Eggs with very thin shells were somewhat more prone to develop rots, and white shelled eggs developed 3 times as many rots as brown shelled eggs exposed to the same conditions. Rotting in machine cleaned eggs was generally increased by holding for several days at room temp. before placing the eggs in cold store. Continuous storage at 20°C. did not, however, result in consistently greater wastage than storage at low temps., followed by 3 weeks at 20°C. When machine-washed eggs were stored at 18°C. there was a delay of at least 14 days before bacteria could be found in the egg contents. It is suggested that, following their initial passage through the shell, the rotting bacteria may, if conditions are suitable, commence growth and gradually penetrate through the membrane to the white. Subsequent development to a rot occurs relatively quickly. —*Auth abst.* (Biological Abstracts)

GILLESPIE, J. M., M. R. J. SALTON, and W. J. SCOTT.
STUDIES IN THE PRESERVATION OF SHELL EGGS. V. THE USE OF CHEMICAL DISINFECTANTS IN CLEANING MACHINES.

Australian Jour. Applied Sci. 1: 531-538. 1950.—The concns. of chemical disinfectants required to prevent bacterial rotting arising from machine cleaning were found to be high. The concns. which controlled rotting destroyed almost all the bacteria on the shells, but concns. sufficiently great to destroy most of the organisms on the shells were not necessarily sufficient to reduce rotting. Repeated use of hypochlorite solns. gave no indication of any cumulative benefit and the repeated use of cationic detergent resulted in a progressive deterioration in the control of rotting. —*Auth. abst.* (Biological Abstracts)

GILLESPIE, J. M., W. J. SCOTT, and J. R. VICKERY.
STUDIES IN THE PRESERVATION OF SHELL EGGS. II. THE INCIDENCE OF BACTERIAL ROTTING IN UNWASHED EGGS AND IN EGGS WASHED BY HAND. *Australian Jour. Applied Sci. 1:* 215-223. 1950.—The exptl. procedure adopted for testing the effects of cleaning on the keeping quality of shell eggs is described in detail. Eggs of known history were randomized prior to treatment and the final judgment was based on the examination of opened eggs. The eggs were held in cold storage for 2-3 mos. and the final examination made after a further 3 wks. at approx 20°C. Wastage was recorded separately for the individual tray lots and statistical analyses were carried out on data subjected to the inverse sine transformation. For unwashed eggs the mean percentage of rots was 1.06 for 3101 dozen eggs tested in 168 expts. The range was from 0.0 to 15.8%, with the median 0.5% soiled eggs kept almost as well as naturally clean eggs. With eggs washed by a number of hand-cleaning procedures the mean % of rots was 2.71 for 1141 dozen eggs tested in 67 expts. The range was from 0.0 to 28.4% with the median 0.4%. The greater mean wastage in hand-washed eggs is attributable to relatively heavy wastage in approx. 10% of the expts. —*Auth. abst.* (Biological Abstracts)

GILLESPIE, J. M., W. J. SCOTT, and J. R. VICKERY.
STUDIES IN THE PRESERVATION OF SHELL EGGS. III. THE STORAGE OF MACHINE-WASHED EGGS. *Australian Jour. Applied Sci. 1:* 313-329. 1950.—The 3 principal types of egg-washing machines used on Australian poultry farms are described. Cleaning on each type of machine causes a greater amt. of bacterial rotting than does washing by hand. For roller machines the mean percentage of rots was 20.7 for 2367 dozen eggs tested in 145 expts., the median value being 17.5%. For 47 expts. with tape machines the mean percentage rotting for 791 dozen eggs was 4.05, with the median value 2.3%. For 14 expts. with brush machines the mean percentage of rots was 7.7. The amt. of rotting depended on the machine on which the eggs were cleaned, and was independent of the farm of origin of the eggs and of the extent to which the eggs were soiled when collected. The harmful effects of the machines were due to the large populations of rot-producing bacteria which they harbored, some of these organisms being transferred to the shells of the eggs during cleaning. The deleterious effects of machine cleaning were eliminated by cleaning in the presence of strong disinfectants, and augmented by inoculating the machines with rot-producing bacteria.—*Auth. abst.* (Biological Abstracts)

GILPIN, G. L., and O. HAMMERLE. (U. S. Dept. Agric., Washington, D.C.)
THE EFFECT OF METHODS OF PREPARATION FOR PACKING ON PALATABILITY OF HOME CANNED CHICKEN. *Poultry Sci. 30:* 914-915. 1951. *An abstract.* (Biological Abstracts)

GOTTSHALL, NEWTON S. (Hales and Hunter Co., Chicago.)
TESTS SHOW LINK BETWEEN DRESSING LOSSES AND BREEDING. *U. S. Egg and Poultry Mag. 57*(11): 14-15. 1951.—Analysis of dressing shrinkage of 300 birds in each of 20 lots at 1951 Maine Broiler Production test shows considerable variation between lots. Conclusions by author are inadequate for data given, but figures are valuable for additional workers in this field.—*G. W. Newell.* (Biological Abstracts)

JENSEN, L. S., E. A. SAUTER, and W. J. STADELMAN. (State Coll., Washington, Pullman.)
THE EFFECT OF AGE OF EGGS ON DETECTION OF BLOOD SPOTS. *Poultry Sci. 30:* 919. 1951. *An abstract.* (Biological Abstracts)

JENSEN, LEO S., and W. J. STADELMAN. (Washington State Coll., Pullman.)
THE EFFECT OF FREQUENT VARIATIONS IN TEMPERATURE ON EGG QUALITY LOSS DURING SHORT HOLDING PERIODS. *Poultry Sci 30:* 788-789. 1951.—A series of 3 expts. were conducted in which eggs were held for 14 days under 9 different temp. treatments. Temps. of 36°, 55° and 72°F. were used. Combinations of pairs of these 3 temps. were used with eggs being changed between temps. 1 or 7 times. There was no difference in degree of breakdown as measured by albumen index or candling when 1 and 7 time changes were compared as long as the eggs were held at the same temps. for the same total time. The cooler the eggs were kept, the higher the quality after 14 days storage.—*Authors.* (Biological Abstracts)

KLOSE, A. A., E. P. MECCHI, I. V. STREETER, and H. L. HANSON. (Western Region Res. Lab., Albany, Calif.)
EFFECT OF TIME INTERVAL BETWEEN SLAUGHTER AND EVISCERATION ON QUALITY AND STORAGE STABILITY OF TURKEYS. *Poultry Sci. 30:* 825-828. 1951.—Warm evisceration of turkeys and evisceration after holding at 34°F. for 26 hrs. were compared for their effects on the initial and storage quality, at storage temps. of −10, 0, and +10°F. Development of off flavors, including visceral taint, was small and not appreciably greater in the 26-hour-held group than in the warm-eviscerated group. Warm evisceration should be recommended for turkeys destined for frozen storage, however, since the 26-hour holding had an accelerating effect on subsequent rancidification. With very good packaging differences in flavor between turkeys stored at −10°F. and +10°F. for 1 yr. were not appreciable.—*A. A. Klose.* (Biological Abstracts)

LARZELERE, H. E. (Michigan State Coll., East Lansing.)
CHANGES IN EGG QUALITY FROM PRODUCER TO CONSUMER. *Poultry Sci. 30:* 921. 1951. *An abstract.* (Biological Abstracts)

LINEWEAVER, HANS, JOYCE D. ANDERSON, and HELEN L. HANSON. (Western Region Res. Lab., Albany, Calif.)
EFFECT OF ANTIOXIDANT ON RANCIDITY DEVELOPMENT IN FROZEN CREAMED TURKEY. *Food Technol. 6:* 1-4. 1952.—Sufficient rancidity may develop during the cooking (simmering) of turkey to be readily detected after it has been creamed. The degree of rancidity development differs for different lots of turkeys and apparently also for individual turkeys in the same lot. The presence of an antioxidant during the cooking of turkey to be used in precooked frozen foods markedly retards the development of rancid flavors and peroxide during both cooking and subsequent frozen storage. Addition of the antioxidant during preparation of the cream sauce rather than during cooking of the turkey less markedly retards development of rancid flavors during storage. Thus the greatest over-all benefit is obtained by adding the antioxidant at the beginning of the cooking process.—*Hans Lineweaver.* (Biological Abstracts)

MacDONNELL, L. R., HANS LINEWEAVER, and R. E. FEENEY. (Western Region Res. Lab., Albany, Calif.)
CHEMISTRY OF SHELL EGG DETERIORATION: EFFECT OF REDUCING AGENTS. *Poultry Sci. 30:* 856-863. 1951.—Small amts. (less than 50 ppm.) of reducing agents such as thioglycol, H_2S, and SO_2 added to broken out eggs rapidly caused the egg white to thin and the chalazae and the yolk membrane to weaken so that the egg simulated a badly deteriorated, aged egg. Shell eggs exposed to an atmosphere containing small amts. of H_2S or SO_2 absorbed the reducing gases and appeared old and deteriorated. Oiling greatly inhibited the absorption

of these gases. Reducing agents were shown greatly to lower the viscosity of blended whole egg white and of solns. of the egg white protein ovomucin. The possibility that the mechanism of nonmicrobial deterioration of shell eggs involves reduction of S-S bonds in ovomucin is discussed.—*L. R. MacDonnell.* (Biological Abstracts)

McNALLY, E. H., and N. H. SPICKNALL. (U. S. Dept. Agric. Beltsville, Md.)
UNIFORMITY OF PROTEIN AND MOISTURE CONTENT OF TOTAL EDIBLE MEAT AND PARTS OF MARKET POULTRY WHEN CALCULATED ON A FAT FREE BASIS. *Poultry Sci. 30:* 924. 1951. *An abstract.* (Biological Abstracts)

PHILLIPS, H. J. and I. L. WILLIAMS. (U. Nebraska, Lincoln.)
SOME FACTORS AFFECTING STABILITY OF CHICKEN FAT. *Food Technol. 6*(2)*:* 74-76. 1952.—Two expts. were conducted in an effort to determine some of the factors affecting chicken fat stability. Moisture, ammonium chloride, and excess (0.3%) vit. E. increased rancidity of rendered fat as measured by peroxide values. An optimal vit. E concn. (0.03%) and the absence of moisture resulted in a more stable rendered fat. Feeding choline chloride or crude betaine fractions of beet juice did not increase the stability of skin fat in cockerels when fed with a normal growing ration. Addition of vit. E to the diet increased the stability of the deposited skin fat.—*H. J. Phillips.* (Biological Abstracts)

SALTON, M. R. J., W. J. SCOTT, and J. R. VICKERY.
STUDIES IN THE PRESERVATION OF SHELL EGGS. VI. THE EFFECT OF PASTEURIZATION ON BACTERIAL ROTTING. *Australian Jour. Applied Sci. 2:* 205-222. 1951.—Pasteurization of shell eggs by immersion in water 57.5-70°C. was capable of eliminating most of the bacterial rots which would otherwise have developed during storage. Significant reduction in rotting was obtained with uncleaned, hand-washed, machine-washed, and inoculated eggs. At temps. below 64-65°C. virtually complete control of rotting may be obtained by periods of immersion less than the limits imposed by coagulation. Above 65°C., however, complete control of rotting cannot generally be achieved without some coagulation of the white. The chances of obtaining complete control of rotting are also reduced as the percentage of infected eggs is increased, and by increasing the temp. and time for which the eggs are held after cleaning and before pasteurization. Effective control of rotting was also achieved by washing either soiled or previously washed eggs in a machine designed for hot-water washing. Pasteurizaiton in paraffin oil was generally less effective in controlling rots than a comparable heat process in water. Experienced candlers were unable to detect most of the rots in oil-treated eggs.—*Auth. abst.* (Biological Abstracts)

SHRADER, H. L. (U. S. Dept. Agric., Washington, D. C.)
THE CHICKEN-OF-TOMORROW PROGRAM; ITS INFLUENCE ON "MEAT-TYPE" POULTRY PRODUCTION. *Poultry Sci. 31:* 3-10. 1952.—This paper tells how breeding for "meat-type" poultry was brought into national prominence by means of state, regional and national contests. Distinctive meat-type strains were developed by breeders and are recognized when compared with production bred and fancy exhibition poultry. Both economy of production and carcass quality values were assessed in special score cards. Mass production methods were adopted by this phase of the poultry industry and the phenomenal increase in volume has been accompanied by an increase in quality and efficiency. In the 1951 national test, 16,000 chickens showed a 3.06 lbs live weight at 10 wks. and 3.73 lbs. at 12 weeks. The feed efficiency was 2.62 lbs. of feed per lb. of gain at 10 wks. and 2.93 lbs. at 12 wks. Over 500 poultry industry leaders located in 42 different states cooperated in this effort. Survey showed that 400 million of the 616 commercial meat-type chickens raised in 1950 carried the improved blood lines of the Chicken-of-Tomorrow contestants.—*H. L. Shrader.* (Biological Abstracts)

SLOSBERG, H. M. (Henningsen Lamesa, Inc., Lamesa, Texas.)
EGGS IN PREPARED MIXES. *Trans. Amer. Assoc. Cereal Chemists 9:* 110-115. 1951.—A discussion of the use of dried eggs in prepared food mixes with some history covering the development of new processing methods for producing more stable dried egg products. Also discussed is the present knowledge of the functional properties of dried eggs in prepared mixes and some of the advantages and disadvantages of the use of these egg products as advanced by the mix industry itself. —*H. M. Slosberg.* (Biological Abstracts)

WETTLING, C., B. BURKART, L. MacDONALD, and A. R. WINTER. (Ohio State U., Columbus.)
METHODS OF CLEANING SOILED EGGS AND THEIR KEEPING QUALITY. *Poultry Sci. 30:* 933. 1951. *An abstract.* (Biological Abstracts)

WOLK, J., E. H. McNALLY, and A. W. BRANT. (U. S. Dept. Agric., Beltsville, Md.)
YOLK MEASUREMENTS USED AS AN INDICATION OF TEMPERATURE DETERIORATION OF EGGS. *Poultry Sci. 30:* 933-934. 1951. *An abstract.* (Biological Abstracts)

MANAGEMENT

CLEGG, ROBERT E., and PAUL E. SANFORD. (Kansas State Coll., Manhattan.)
THE INFLUENCE OF INTERMITTENT PERIODS OF LIGHT AND DARK ON THE RATE OF GROWTH OF CHICKS. *Poultry Sci. 30:* 760-762. 1951.—A change in the method of supplying light influences the rate of growth of chicks. Chicks exposed to alternate 6-hr. periods of light and dark were 66 g. heavier than chicks exposed to alternate periods of 12 hrs. of light and dark. In the same manner chicks subjected to alternate 2-hr. periods of light and dark were 102 g. heavier at 6-wks of age. Except for a slight reduction this wt. differential was maintained until the chicks reached broiler size.—*Auth. summ.* (Biological Abstracts)

MUELLER, CLYDE D., T. B. AVERY, HERMAN D. SMITH, and R. E. CLEGG. (Kansas State Coll., Manhattan.)
EFFECTS OF CONTROLLED LIGHT AND TEMPERATURE FOR LAYING HENS. *Poultry Sci. 30:* 679-686. 1951.—White Plymouth Rock chickens were reared for 2 yrs. under natural and controlled conditions of light and temp. Sexual maturity was attained earliest by pullets receiving more than 12 hrs. of light daily. The short days of natural light resulted in a partial molt during the first laying year and a more rapid and complete molt at the end of the laying year than was noted in birds reared under controlled light conditions. Body wts. decreased during these periods of molt. Egg size was depressed by high environmental temps., but egg quality was little affected by variations in light and temp. to which the laying flock was exposed.—*C. D. Mueller.* (Biological Abstracts)

MUELLER, CLYDE D., FRED MOULTRIE, L. F. PAYNE, H. D. SMITH, and R. E. CLEGG. (Kansas State Coll., Manhattan.)
THE EFFECT OF LIGHT AND TEMPERATURE ON MOLTING IN TURKEYS. *Poultry Sci. 30:* 829-838. 1951.—Restriction of light to 12 hrs. daily from 4 to 16 wks. of age and to 10 hrs. daily from 17 to 28 wks. of age resulted in reduced molting of the first post-juvenile plumage in turkeys. When such turkeys were dressed, fewer pinfeathers were noted than were present for birds of the same age and origin reared under natural daylight or for those provided 15 hrs. of light daily. Temp. variations within the range from 44° to 70°F. had no apparent influence on molting. Turkeys reared under the restricted light condi-

tions were relatively free of pinfeathers by 24 wks. of age. Such birds when dressed on October 20 at 28 wks. of age exhibited an appearance comparable to that normally expected a month later in turkeys reared under natural light.—*Auth. summ.* (Biological Abstracts)

PARNELL, E. D., and J. H. QUISENBERRY. (Texas A. and M. Coll., College Station.)
MARKET EGG QUALITY AS AFFECTED BY NEST-TYPE USED. *Poultry Sci. 30:* 926. 1951. *An abstract.* (Biological Abstracts)

GENERAL

ANDERSON, R. W., R. M. BLAKELY, and H. I. MacGREGOR. (Dominion Exptl. Sta., Swift Current, Sask., Canada.)
THE EFFECT OF ALDRIN ON GROWING TURKEYS. *Poultry Sci. 30:* 905. 1951.—The insecticide aldrin is highly toxic. (Biological Abstracts)

ASMUNDSON, V. S., and F. H. KRATZER.
TURKEY PRODUCTION IN CALIFORNIA. *Circ. California Agric. Ext. Serv. 110:* 1-60. Illus. 1951. (Biological Abstracts)

CALLENBACH, E. W. (Pennsylvania State Coll., State College.)
THE APPLICATIONS OF COMPREHENSION EXAMINATIONS IN THE FIELD OF POULTRY HUSBANDRY. *Poultry Sci. 30:* 909. 1951. *An abstract.* (Biological Abstracts)

HENDERSON, E. W. (Michigan State Coll., E. Lansing.)
A SUGGESTED PROGRAM OF GRADUATE STUDY FOR POULTRY HUSBANDRY. *Poultry Sci. 30:* 917. 1951. *An abstract.* (Biological Abstracts)

MacDONALD, A. J., S. G. IYER, and I. B. TURKMAN. (Indian Vet. Res. Inst., Izatnagar.)
POULTRY KEEPING IN INDIAN VILLAGES. *Indian Jour. Vet. Sci. and Animal Husbandry 20:* 211-217. 1950.—A study was made to explore the possibilities of developing poultry keeping under rural conditions. In 48 selected villages birds of different breeds were distributed and the record of the progress kept. Over 50% of the birds were found lost due to avoidable causes, the most common being attack from wild animals and noncontagious diseases. The avg. number of eggs per bird varied from 40.0 to 88.3/annum. No outstanding difference was noticed between the indigenous, cross-bred and imported breeds in their egg production.—*N. N. Dastur.* (Biological Abstracts)

SHULTIS, ARTHUR, and W. E. NEWLON.
THE CHICKEN BUSINESS IN CALIFORNIA. *Circ. California Agric. Ext. Serv. 147:* 1-23. Illus. 1951.—Reasonable expected profits, based on averages of records in poultry management studies over 26 yrs., are given. All phases of the economics are treated. (Biological Abstracts)

SWEET, M. C.
EGG LAYING TEST FINALS. *Poultry Tribune 57*(11)*:* 10, 60-66. 1951.—A summary of winners in the 15 U. S. Egg Laying Tests in the year ending Sept. 15, 1951. Considering the total birds entered in all contests, 78 Rhode Island Reds entered by Harco Orchards, South Easton, Mass. had first rating. These birds averaged 253 eggs per bird with a viability of 91.03%.—*F. P. Jeffrey.* (Biological Abstracts)

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Mr. Ahmet C. Akpinar (M.S., University of Maryland), formerly an instructor in poultry husbandry at the Technical Agricultural School, Bursa, Turkey, served as interpreter for three months to a group of Turkish agricultural officials who were studying agricultural extension methods and research programs, including poultry, carried on in nine states of the U.S.A.—Morley A. Jull

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HIGH EGG PRICES IN ARGENTINA

According to the latest report of the Office of Foreign Agricultural Relations of the U. S. Dept. Agr., egg prices in Argentina during 1952 were up to four times as high as in 1951. No storage eggs have been available for some time because storage operations during the latter part of 1951 were greatly reduced. In June 1952, wholesale egg prices were 11 to 12 pesos (U. S. 79 to 86 cents) per dozen and retail prices were 16 to 18 pesos (U. S. $1.15 to $1.30) per dozen. On July 3, 1952, at the free-market rate, one Argentine peso was equal to 7.2 U. S. cents.—Morley A. Jull.

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In accord with the Constitution the July-September number of the World's Poultry Science Journal has not been mailed to those persons whose 1951 subscription has not been paid. Copies are being held and will be sent immediately upon receipt of the subscription.

If the 1951 subscription is not paid by the end of the year the member's name will be removed from the membership list.

It is suggested that the 1953 subscription will be received at any time. It will save the editor considerable labor if the subscription is paid early and numbers of the Journal do not need to be withheld. It will also save labor and expense in sending reminders to the members. Many of the members have been cooperating in this regard. The Secretary and Assistant-Secretary now make a special request *to pay your subscription for* 1953 *early.*

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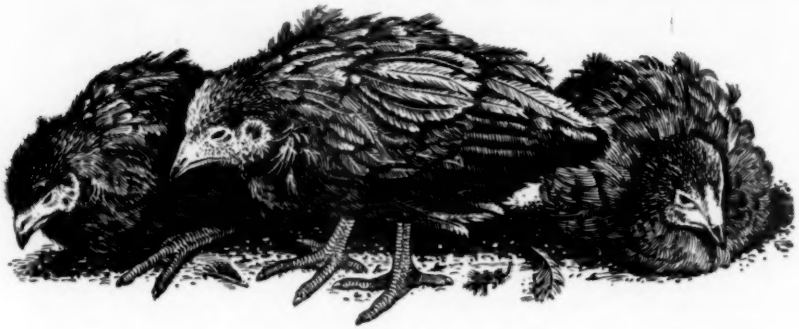

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1 Is it stable to pelleting and storage?	YES Feeds may be pelleted or stored without loss of activity.				
2 Is it likely to cause resistant strains?	NO				
3 Is it compatible with other drugs?	YES Poultrymen can use other drugs, including the sulfas, to treat other diseases simultaneously.				
4 Is it compatible with vaccination?	YES Poultrymen can vaccinate routinely.				
5 Does it have an adequate margin of safety?	YES Low toxicity of MEGASUL permits its use at levels that give maximum results against coccidiosis with minimal chance of injury.				

If you are not now using MEGASUL Nitrophenide in your feeds, write us for full information at the address below.

*Reg. U. S. Pat. Off.

Animal Feed Department

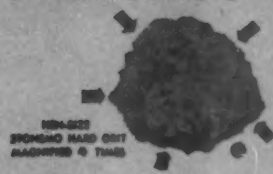
LEDERLE LABORATORIES DIVISION

30 Rockefeller Plaza — American Cyanamid Company — New York 20, N. Y.

How to reduce your feeding costs

per dozen eggs
or
pound of meat

STONEMO'S EXTRA GRINDING SURFACES



help your feeds

do more work at less cost!

Tests show that hens average 7% more eggs with 6.8% less feed—broilers show a feed efficiency *increase* up to 5 pounds of meat per 100 pounds of feed—when insoluble grit is included in their feed programs.

Poultrymen everywhere are profiting handsomely from such results. That's why they insist upon STONEMO insoluble grit as part of all their feeding programs to *grind out more eggs or meat from every pound of feed.*

STONEMO's *extra grinding surfaces* grind out more value from the nutrients in the birds' feed—help make these nutrients more usable for better egg production and faster growth. STONEMO saves costly feed—gives you bigger profits at market time.

Insist upon STONEMO, the hard insoluble grit, to grind out bigger profits for you. Ask for STONEMO at your local feed or poultry supply dealer. Remember STONEMO's cost is small—its savings large.

STONE MOUNTAIN GRIT COMPANY

Executive Offices & Quarry, LITHONIA, GEORGIA

Branch Quarry, BARRE, VT.